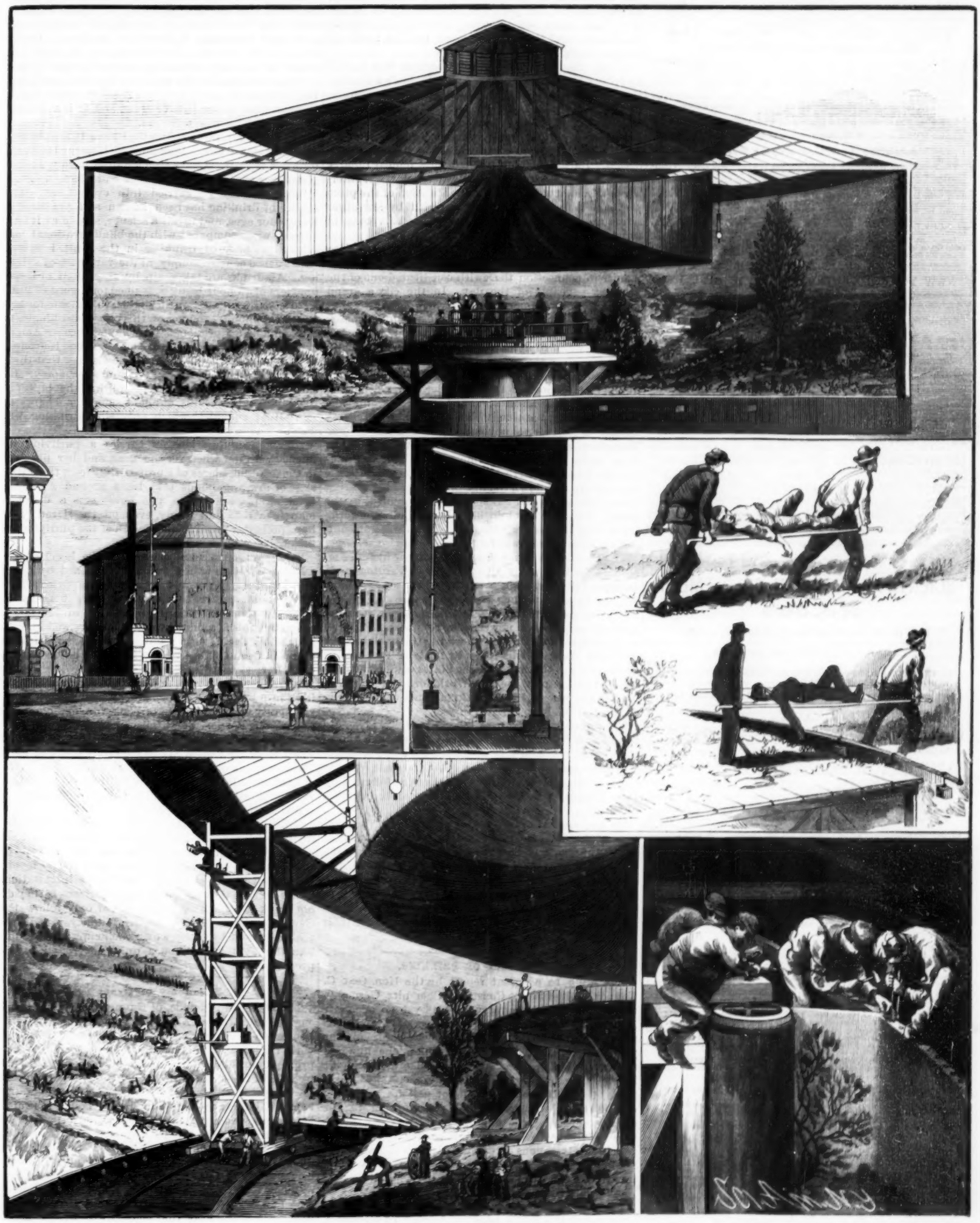
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LV.—No. 19. [NEW SERIES.] NEW YORK, NOVEMBER 6, 1886. [Price 10 Cents. $3.00 per Year.



THE CONSTRUCTION OF THE CYCLORAMA.—[See page 298.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, NOVEMBER 6, 1886.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 566,

For the Week Ending November 6, 1886.

Price 10 cents. For sale by all newsdealers.

THE INAUGURATION OF THE STATUE OF LIBERTY.

About the year 1870, the French sculptor Bartholdi, having conceived the idea of executing a colossal statue, to be presented by his nation to the people of America, consulted with his friends and arranged a scheme for carrying out his ideas. Four years later the plan was made public. By subscriptions from the people of France, it was proposed to raise sufficient money to pay for the expenses of the work. A popular subscription was set on foot, and with the aid of entertainments the necessary sum was raised, and in 1876 the work was well under way. A part of the statue was sent to this country. Visitors to the Centennial in 1876 will remember the hand holding the torch, that was erected in the grounds near the main building. Subsequently it was placed in Madison Square in this city. The design selected was "Liberty enlightening the World," and this was her hand holding aloft the flaming torch.

In 1877 the necessary Act of Congress was passed accepting the statue and assigning Bedloe's Island, in the harbor of New York, as the place for its erection. In 1883, the statue being completed, the pedestal was commenced. This was erected by subscriptions and by the proceeds of entertainments in this country. The pedestal represents America's contribution to the design. Its situation on Bedloe's, now named Liberty Island, brings it close to the side of every vessel entering or leaving the port, while the isolation of the place prevents it from being interfered with by any other structure. It must always be visible from base to summit.

On October 28 the statue was formally presented to the people of the United States, and the public ceremonies in connection therewith constituted one of the greatest pageants of the day. In the city a grand parade from the upper streets down to the Battery, at the southerly end of the city, took place, in which the militia, the old volunteer fire department, and many societies were represented. This was a splendid affair.

The naval demonstration was also very fine. A large number of steamers, formed in order of naval parade, came down the Hudson River and gathered around the base of the great statue, which towers above Liberty Island. Near this point, the United States men of war Tennessee, Minnesota, Yantic, Jamestown, and Saratoga were anchored in line. The United States steamer Dispatch carried President Cleveland. As she steamed up and down the line of war vessels to review them, their yards and bowsprits were manned by the sailors, standing hand in hand high in air, and forming a most impressive spectacle. The display of bunting on all sides was profuse.

The ceremonies at the base of the statue included an address in French by Count Senator Ferdinand de Lesseps. His concluding words, which we give here, we may hope are a true prophecy:

"Soon, gentlemen, we will find ourselves reunited again to celebrate a new Pacific conquest. Farewell until we meet at Panama, where the thirty-eight stars of North America will come to float by the side of the banners of the independent States of South America, and will form in the New World for the good of humanity the peaceful and fruitful alliance of the Anglo-Saxon and the Franco-Latin races."

The presentation address followed; it was given by the Hon. William M. Evarts, as chairman of the American committee, and was addressed to the President. In a short speech the latter accepted the statue in the name of the American people, and he was followed by Hon. Chauncey M. Depew, who delivered the oration of the day.

To the spectators on the many steamers, the manning of the yards and the naval salutes were the most interesting parts of the ceremony. In addition to the firing, the great fleet of steamers blew their whistles continually during these times. In the grand salute a battery of the Gatling guns joined, and the effect of the artillery fired at rapid intervals, with the continuous roll of the Gatling guns as a background for their intermittent rounds, was very fine.

THE SCIENCE OF DRINKING.

According to a recent report by the Hon. Geo. C. Tanner, United States Consul at Chemnitz, Germany, the citizens of this country have as yet no adequate idea of the real science of drinking. He gives the total beer production of the German empire for the year 1885 at 1,100,000,000, or one billion one hundred millions of gallons, and of wines and other alcoholic liquors, nine hundred millions of gallons, making a total of two thousand millions of gallons. This, the consul states, was the actual consumption in the empire, as the importations are equal to the exportations. The aggregate production for Germany he gives at forty gallons a year per capita, estimating the population at fifty millions. He gives the consumption in this country at ten gallons per capita. Consul Tanner further says:

"I have given this subject careful attention, and have stated the entire beer production of Germany, including Alsace-Loraine, and am sure of the accuracy of my figures. One can, then, form some idea of the enormous quantity of beer produced, when it would form a lake more than one mile square and six and a half feet deep, or it would make a running stream as large as some of our rivers.

"This is only taking into account one item in the economy of drinking in Germany. Wines and all kinds of spirituous liquors are freely used; wines to a much greater extent than stronger liquors. It may be safely stated that the consumption of all intoxicants in this empire would reach nearly two billions of gallons per annum. This being the case, some faint conception of the enormous drinking capacity of the Germans can be formed. The hops, barley, rye, potatoes, and other ingredients that enter into the manufacture of this enormous quantity of liquors would be more than two billions of pounds, and would form a good sized mountain if placed in one heap. Beer is the national beverage, and is used as such, if not to a greater extent than water, then assuredly equally so.

"Wines are used by the wealthier classes at meals, and very extensively used; but beer is never absent from a German table of the rich or poor, and it is a decided favorite with all true Germans.

"Since my arrival in Germany, I have to see the first glass of water drunk. Beer must be furnished servants for their repasts. I have seen children hardly weaned given beer without any apparent bad effect. . . .

"Science may be carried into everything. The science of drinking has been known and practiced in Europe for ages, and this is a science, simple as it may appear, when compared with the blind, irrational, and suicidal manner of drinking in the United States. This science consists simply in the tardiness of drinking. All drinks are taken sip by sip, a half or three-quarters of an hour being consumed for a glass of beer. This is so simple that one is liable to ridicule for laying stress upon it, and yet on this one point hinges, in my opinion, a question of vast importance to Americans. By this manner of drinking, the blood is aroused to a greater activity in so gradual a manner that there is no violent derangement of the animal economy. By slow drinking the German accomplishes the object of drinking, and gives his animal economy a chance to say, 'Hold, enough!' which only slow drinking will do. . . .

"Woman unquestionably carries a purifying influence with her wherever she goes, and her presence in the drinking places of Europe drives from them that class of low vagabonds that hang around American drinking places. Hence, one never sees a drunken man in a cafe, and rarely, even, on the street. Perhaps no better possible illustration of the purifying influences of woman could be found.

"Cafes are open to all classes, but the lower classes seldom visit them; they would be abashed by doing so as much as they would by entering a parlor where they would meet refinement and elegant manners. There are some exceptions to this rule in the larger cities, but this is confined to cafes that are well known, and ladies avoid them; but there are no drinking places in Germany but what a lady may enter with all propriety.

"Drunkenness is rare, and if so, it rarely manifests itself in a boisterous or belligerent manner, but more frequently takes the shape of song, fun, and a general pleasurable feeling of warmth, energy, and self-command, and hence those horrid crimes that sometimes shock us in the United States are rarely heard of here. Then, why should there exist such a difference in the evils of drinking in Europe and in the United States? It is manifestly the result of the manner of drinking in vogue in the two hemispheres."

Some curious inferences might be drawn from Consul Tanner's report. Figuratively regarded, the time wasted by the Germans in swilling beer at half or three-quarters of an hour per glass must be enormous; but then it is alleged to save them from intoxication. Can it be true the trouble of the Americans is they do not drink enough, and if they would only follow the German science in the matter, namely, quadruple their drinks and sit longer over their cups, they would, like the Teutons, become a quiet, sober, and happy people?

Economy of Heat.

The steamship Bleville, of Havre, recently built and engined by Messrs. Alex. Stephen & Sons, of Linthouse, is a steel screw steamer, 300 ft. long, and is fitted with triple expansion engines of 210 N. H. P. The principal novelty is in the design of the boilers. In the uptakes of these—Kemp's patent compound high and low temperature—tubes are so arranged that the water, before it enters the high temperature boiler, is heated by the gases from the fires, which would otherwise be lost. On her trials, the feed-water, which leaves the engine, and in ordinary cases enters the boilers at about 120°, was raised to about 360° Fah. The temperature of the waste gases on leaving the tubes of the ordinary boiler was shown by pyrometer to be about 630° Fah. This was reduced to about 300°, showing how much of the heat that generally is wasted is absorbed in this design.

To Recover Photo Silver Waste.

A. C. HOPKINS.

In common with most photographers, I have a small dark room, but because there is a sink and waste-pipe in the room, I do my toning there.

At the end of the sink I had, until recently, a large barrel into which I poured the first two or three washings from my prints, and to which I would occasionally add a handful of salt. When the barrel became full (which took a week or ten days), I put in more acid to clear it up, as directed in a circular issued by the refiners. But I found that it did not clear well, either because I used too much salt or not enough acid; and, drawing off the water before it had settled, I knew that I was wasting a great deal of silver. Then, too, a barrel of stagnant water, standing in a small room, is not conducive to health or comfort. So I decided to dispense with mine, and found a substitute in the following simple process:

After soaking my prints for five minutes in water made slightly acid by acetic acid, I remove them to another dish, and add to the water from which I have just taken them about a teaspoonful of salt, and stir it rapidly for a moment with the hand, when it becomes as white and thick as milk. This solution I then pour into a common wooden pail, which will hold enough water for the first washing of a hundred prints, and the next day, when I am ready to tone again, I find that my solution has become perfectly clear, and in the bottom of the pail I have a clear white sediment—pure chloride of silver. I then pour off the water to within an inch of the bottom, and the pail is then ready to be filled again.

I find that by adding salt to the second water in which I washed the prints, there is hardly a trace of silver, and it is not worth saving. About once a month I pour the settlings from the pail through a fine cloth to filter it, and throw the cloth and contents into the silver paper clippings. In this way I save more than half of the silver used in making the print.—*Anthony's Bulletin.*

Mineral Products of the United States, 1885.

The following condensed statement of the mineral production of the United States in the calendar year 1885 is from advance proof sheets of a report shortly to be issued by the United States Geological Survey. This volume will be the third of the series known as "Mineral Resources" reports, prepared by the Division of Mining Statistics and Technology.

Metallic Products of the United States in 1885.

	Quantity.	Value.
Pig iron, spot value.....tons	4,044,525	$64,712,400
Silver, coining value.....t. oz.	29,910,279	51,600,000
Gold, coining value..... "	1,538,376	31,801,000
Copper, value at New York city *a*.....lb.	170,962,607	18,292,999
Lead, value at New York city.....tons	129,412	10,469,431
Zinc, value at New York city..... "	40,698	3,539,856
Quicksilver, value at San Francisco,..flasks	22,073	979,189
Nickel, value at Philadelphia.....lb.	277,904	191,753
Aluminum, value at Philadelphia.....t. oz.	3,400	2,550
Platinum, value, crude, New York city "	250	187
Total.....		$181,589,365

a Including copper from imported pyrites.

Non-metallic Mineral Products of the United States in 1885 *(spot values).*

	Quantity.	Value.
Bituminous coal, brown coal, lignite, and anthracite, mined elsewhere than in Pennsylvania.....l. tons *a*	64,840,668	$82,347,648
Pennsylvania anthracite..... " *b*	34,228,548	76,671,948
Petroleum.....bbl.	21,842,041	19,193,694
Building stone.....		19,000,000
Lime.....bbl.	40,000,000	20,000,000
Salt..... "	7,038,653	4,825,345
Cement..... "	4,150,000	3,492,500
South Carolina phosphate rock.....l. tons	437,856	2,846,064
Limestone for iron flux.....		1,694,656
Mineral waters.....gal. sold	9,148,401	1,312,845
Natural gas.....		4,854,300
Zinc, white.....s. tons	15,000	1,050,000
Concentrated borax.....lb.	8,000,000	480,000
New Jersey marls.....s. tons	875,000	437,500
Mica.....	92,000	161,000
Pyrites.....	49,000	220,500
Gold quartz souvenirs, jewelry, etc.....		140,000
Manganese ore.....s. tons	23,258	190,281
Crude barytes..... "	15,000	75,000
Ocher..... "	3,950	43,575
Precious stones.....		69,900
Bromine.....lb.	310,000	89,900
Feldspar.....l. tons	13,600	68,000
Chrome iron ore..... "	2,700	40,000
Asbestos.....s. "	300	9,000
Slate ground as a pigment.....l. "	1,975	24,687
Sulphur.....s. "	715	17,875
Asphaltum..... "	3,000	10,500
Cobalt oxide.....lb.	68,723	65,373
Total.....		$239,431,991

a The commercial product, that is, the amount marketed, was only 63,569,284 tons, valued at $80,640,564.

b The commercial product, that is, the amount marketed, was only 32,265,421 tons, valued at $72,274,544.

Resume of the Values of the Metallic and Non-Metallic Mineral Substances produced in the United States in 1885.

Metals.....	$181,589,365
Mineral substances named in the foregoing table.....	239,431,991
	$421,021,356
Estimated value of mineral products unspecified.....	7,500,000
Grand total.....	$428,521,356

Ostriches at Los Angeles.

Within six miles of this beautiful place, on what is known as the old Temple street road, Dr. C. J. Sketchley has started an ostrich farm. He was one of the pioneers in ostrich farming in Africa, where he engaged in the business for many years, and is the author of a number of books on the ostrich and the best methods of ostrich farming. A visit to Los Angeles convinced the doctor that ostrich farming could be successfully carried on there, and he resolved to make the experiment. The result is the Sketchley ostrich farm.

On the sixty acres of land devoted to the ostriches there are thirty pairs of these beautiful birds, besides a number of young ones recently hatched.

Their food consists almost wholly of corn and alfalfa, which is a beautiful plant of the Luzerne family. Long experience has shown that this bill of fare will cause the ostrich to produce more feathers and of a better quality than any other diet. Each male is mated, and the two birds have two acres of ground. The land is fenced off into lots of one acre each. The two birds are kept in one of these lots until they have eaten off all the alfalfa, when they are transferred to the other, being thus alternated between the two. From the observatory tower in the center of the doctor's residence the ostrich grounds look like an immense chessboard, and the gigantic birds like the big pieces scattered over it.

"All the full grown ostriches you see," said the doctor, "I imported directly from Africa, landing them in this country at Galveston, and bringing with them four Madrasese men and one woman, the people of that tribe being more familiar with the ostrich than any native Africans. Thus far my experience has succeeded beyond my expectations. Not only are the ostriches quite as healthy as in Africa, but they are actually more prolific here than in their native country, both in the number of eggs they lay and the number of young ones they hatch, and also in the quantity of feathers they produce—results due, I believe, to this glorious climate, which seems greatly to increase the fertility of all animals. The feathers are fully equal in all respects to any grown in Africa.

"The height of the birds is from 8 to 12 feet. Their weight varies from 300 to 400 pounds. The male is much the larger, and is black, while the female is gray. Where, then, you will ask, do white ostrich feathers come from? They are found on both the male and female birds among the loose feathers of the wings and tail. It is the fact that they are so much rarer that makes them so much more desired, and, consequently, so much higher in price than black or gray feathers, for in some respects I consider them inferior to the other feathers.

"The female ostrich does not begin to lay eggs until it is four years old, but it produces its first crop of feathers at the end of its first year. Every seven months thereafter its plumage is ready for market, yielding about 25 of the very finest feathers, besides a large number of less valuable ones. The feathers are not plucked, but are cut off, quite close to the skin, with large shears made for the purpose. No pain whatever is inflicted in the operation. Within a few days after the feathers have been cut the stubs dry and shrivel to such an extent that they are easily removed. The longest and finest white feathers are worth at wholesale $4 apiece, and good feathers are worth $200 a pound. The first clipping of young birds will average $40 in value. Of course, it requires a good deal of capital to start a large ostrich farm, as a full grown pair of birds is worth from $700 to $800, and a single young bird six months old costs from $150 to $200; but after it is once under way, the return from the investment is a large one.

"We very seldom permit the ostriches to do their own hatching, but most of it is performed by incubators. The old idea that ostriches seldom or never require water has long since been proved false. They drink frequently, and even bathe. We keep a water trough in each pen to enable them to do so. No one knows to what age an ostrich may attain, but I believe they are little short of immortal. In Africa I have seen a pair of birds that were known to be over 80 years of age."

I reminded the doctor of a promise he had made me to show me a foot race between ostriches. We immediately went to a broad open space between the ostrich pens and the house. One of the keepers opened the door of one of the pens, and in response to the doctor's call, two superb ostriches came running to him. After caressing the gentle creatures for a few moments he showed them a handful of figs, of which they are extremely fond. Two of his men then restrained the birds by placing nooses about their legs, until he and myself had walked away about a quarter of a mile. Then, at a signal from the doctor, the birds were released, and the race began. It was a rare sight. Ornithologists tell us that the stride of the ostrich when feeding is from 20 to 22 inches; when walking, but not feeding, 26 inches; and when terrified, from 11½ to 14 feet. It seemed to me that in this race for a handful of figs from their master, these gigantic birds covered the last-named distance at every stride. Like the wind they came, their great necks stretched forward and upward to their utmost length, and their wings working. They kept well abreast for nearly half the distance, and then one began to forge ahead. He increased his lead till within a short distance of us, when he turned his head, and, seeing that his competitor was considerably in the rear, he slackened his pace, and, jogging up to the doctor, received his reward in figs and caresses.

Besides Dr. Sketchley's farm there is another ostrich farm near Anaheim, a thriving town on the Southern Pacific Railroad, twenty-five miles from Los Angeles.—*N. Y. Sun.*

DECISION RELATING TO PATENTS.

U. S. Circuit Court.—Western District of Pennsylvania.

THE PENNSYLVANIA DIAMOND DRILL COMPANY *v.* SIMPSON *et al.*

Acheson, J.

The patents of Ball and Case, No. 247,872, dated October 4, 1881, and No. 248,982, dated November 1, 1881, are for inventions made by them prior to similar inventions made by Allison, and described in his patent No. 261,978, dated August 1, 1882.

Allison, in 1870, conceived of the invention described in his patent of 1882, and made rough sketches of the same, one of which is preserved; but made no model, and did not consider the invention worth putting into a permanent form, and has never since made the machine; he applied for his patent, at the instance of his assignee, after Ball and Case had applied promptly after invention and had obtained patents and had put the patented article on the market. *Held* that under these circumstances Ball and Case were prior inventors.

A mere conception not seasonably followed by some practical step counts for nothing as against a subsequent independent inventor, who, having complied with the patent laws, has obtained his patent.

One who has conceived of a new device and proceeded so far as to embody it in rough sketches, or even in finished drawings, cannot there stop and yet hold that field of invention against all comers for a period of twelve years.

It was sufficient to raise the question of priority of invention for defendants in their answer to deny that Allison was the original and first inventor, and to justify under the prior patents of Ball and Case without alleging an abandonment by Allison.

In an interference proceeding in 1873, upon a different invention of the same general character, Allison has testified to making the invention here in question; but this testimony did not constitute invention any more than did the previous sketches.

Letters patent No. 147,492, granted to G. Frisbee, February 17, 1874, for core lifters, declared valid and infringed by defendants.

Where the claim of the Frisbee patent was for the combination of an annular core lifter and a tube with an inner tapering recess, and the patent described a loose elastic cut ring within a tapering recess in a boring tube, and the defendants used a loose solid unelastic ring in a cylindrical recess in a boring tube, but this ring had four dependent springs with jaws, which engage with inclines at the lower end of the recess, and the purpose and mode of operation of the two devices were similar, the difference in the construction was not material, and the claim was infringed.

Where the suit fails upon one patent and prevails upon another, the complainant is entitled to a decree; but the costs are the subject of equitable consideration by the court.

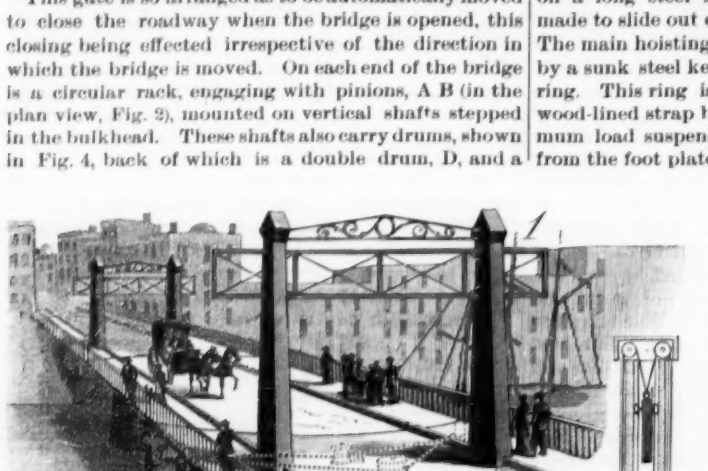
Evil of Indorsing.

I affirm, says Judge Waldo Brown, in the *Boston Traveler*, that the system of indorsing is all wrong, and should be utterly abolished. I believe that it has been the financial ruin of more men than, perhaps, all other causes. I think that our young men especially should study the matter carefully in all its bearings, and adopt some settled policy to govern their conduct, so as to be ready to answer the man who asks them to sign his note. What responsibility does one assume when he indorses a note? Simply this: He is held for the payment of the amount in full, principal and interest, if the maker of the note, through misfortune, mismanagement, or rascality, fails to pay it. Notice, the indorser assumes all this responsibility, with no voice in the management of the business and no share in the profits of the transaction, if it prove profitable; but with a certainty of loss if, for any of the reasons stated, the principal fails to pay the note.

MR. T. V. CARPENTER, long and favorably known to many readers of this paper, died at his home, Newton, Mass., on October 17. Mr. Carpenter had taken up his residence at Newton quite recently, but had returned to New York on business a few days before his death, where he contracted a cold, which developed into pneumonia, which terminated his life. Mr. Carpenter was a conscientious Christian gentleman, very much respected by a large circle of friends and by all with whom he had business relations.

DRAWBRIDGE GATE.

This gate is so arranged as to be automatically moved to close the roadway when the bridge is opened, this closing being effected irrespective of the direction in which the bridge is moved. On each end of the bridge is a circular rack, engaging with pinions, A B (in the plan view, Fig. 2), mounted on vertical shafts stepped in the bulkhead. These shafts also carry drums, shown in Fig. 4, back of which is a double drum, D, and a



QUATERMASS & ELLSWORTH'S DRAWBRIDGE GATE.

guiding sheave, C, carried by an adjustably mounted bracket. An endless wire rope or chain passes around these drums, as shown in Fig. 2. The gate slides in slots in two posts mounted upon either side of the roadway. Two ropes, secured to opposite sides of the drum, D, pass under sheaves, E F, at the bottom of the posts, thence over sheaves at the top of the posts, and have their ends attached to the gate, which is provided with suitably arranged counterweights.

It is evident that, no matter in which direction the gate may be moved, the pinions will be rotated so as to carry the rope in the direction indicated by the arrows, so that the drum, D, will move to unwind its chains and permit the gate to move down. Appropriate stops prevent the gate from being lowered beyond a certain point. Fig. 3 represents a modification, in which the barrier closing the roadway consists of two swinging arms, G, carried by vertical shafts having drums mounted upon them. The illustration clearly shows the manner of operating these arms.

This invention has been patented by Messrs. R. Quatermass and H. R. Ellsworth, of Moline, Kansas.

SCRAPING TOOL.

Secured to a suitable handle is a bar of uniform width throughout its length, but diminishing in thickness from the end next the handle. Fitted to the bar is a clamp, shaped as shown in Fig. 3. The thin end of the bar is inserted between the arms and body of the clamp and a hardened and tempered scraping bit is placed between the clamp and the bar. When the clamp is driven on the bar, the latter causes the clamp to draw tightly against the bit, which is held firmly in position for use. By means of this improvement, the bit may be made of uniform temper throughout its entire length, and may be moved forward as fast as it is worn away by grinding. In addition to the advantages secured by the adjustment of the scraper, this construction gives a peculiar elasticity, which causes the scraper to work smoothly.

This invention has been patented by Mr. James Wright, of Torrington, Conn.

STEAM TRAVELING CRANE.

The steam traveling crane forming the subject of illustration, by Henry J. Coles, of 89 Sumner Street, Southwark, is shown at the Liverpool Exhibition. It is of five tons power at a radius of 16 ft., lighter loads being raised at proportionately greater radii. The crane has two steam cylinders, each 7 in. in diameter by 10 in. stroke, fitted with an improved form of reversing motion. The lifting gear is single purchase, of the proportions of about 8 to 1; and as the steam cylinders are of ample area, a quick speed of lifting is attained without running the engines at an excessive number of revolutions. The hoisting pinion is fitted on a long steel feather on the crank shaft, and is made to slide out of gear when lowering by the brake. The main hoisting wheel is keyed to the barrel shaft by a sunk steel key, and has cast to it a strong brake ring. This ring is turned and fitted with a powerful wood-lined strap brake, capable of holding the maximum load suspended, and worked by a suitable lever from the foot plate. The chain barrel is 12 in. in diameter, of great width, having turned flanges; and for any ordinary depth of working it coils the whole of the chain without a lap. The maximum loads are raised at a moderate speed, using the snatch block and return chain. A very quick speed for loads up to about 2½ tons is obtained by working in single chain only.

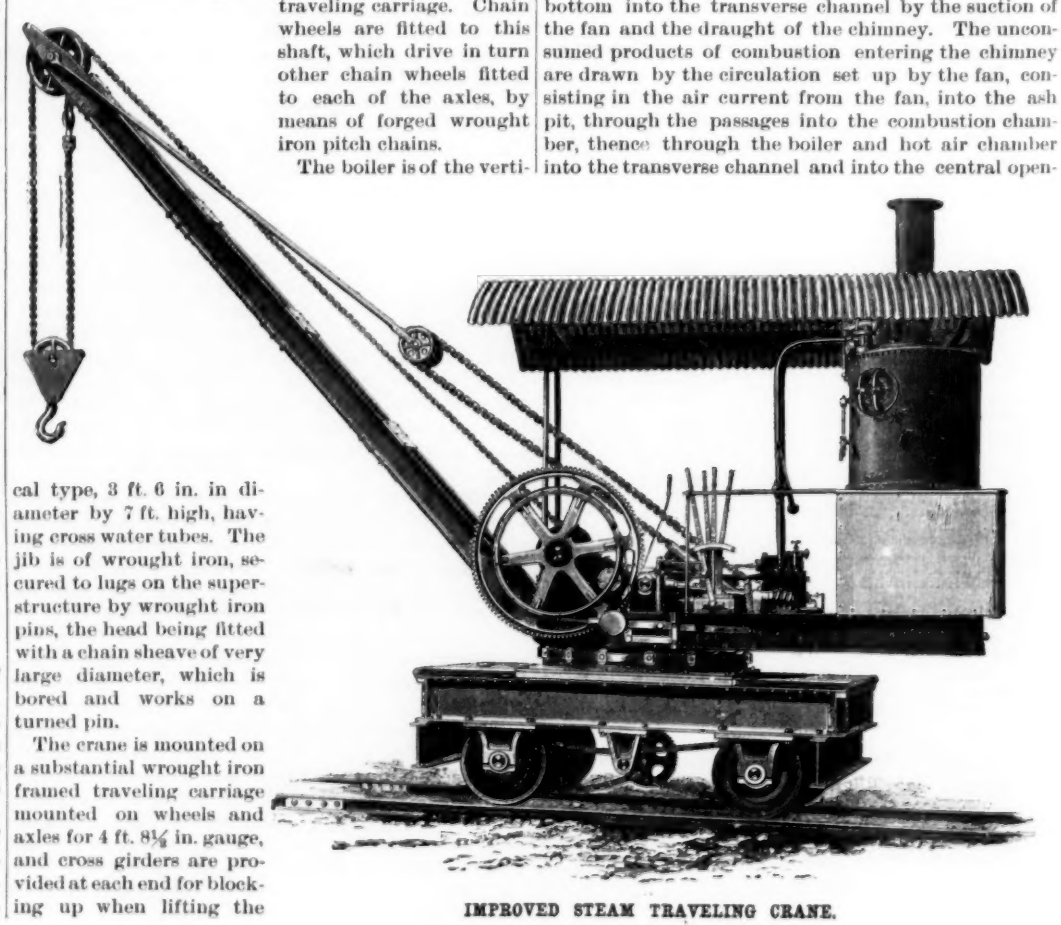
The crane revolves completely round in either direction by steam power without stopping or reversing the engines; and an improved arrangement of loose slewing rack is placed between the upper and lower portions of the crane, which prevents all risk of breakage to the gearing, should the crane be started or stopped too suddenly. The friction cones, which transmit the power from the engines for the revolving motion, are fitted to a shaft running in wide gun metal bearings having loose caps and lock nuts. This shaft is bored up, and has passing through it a spindle fitted at the end with a cotter, this cotter being fitted to the female clutch and held by the spindle. A collar is formed at the outer end of the spindle, which runs in a circular box having phosphor-bronze friction washers on either side to take the thrust of the friction cone. The circular box is attached to a screw working in a suitable nut, so that by merely turning the box in either direction the female cone clutch is worked to correspond, and the rotating motion is imparted to the crane. This method of actuating the cones has been in use in these cranes for some years, and was adopted to obviate the great wear and tear which occurs in the case of a ring either wholly or partially encircling the clutch.

The radius of the jib is varied at pleasure by means of steam derrick motion worked from the crank shaft by suitable bevel gearing driving a steel worm and tangent wheel. The wheel is fitted to the derrick chain barrel, and securely holds the jib locked in any position.

The crane also has its own propelling power for traveling on the rails. The center pin is bored up, and a steel shaft passes through it, having bevel gearing fitted at the top driven from the crank shaft, with a pinion at the lower end gearing into a bevel wheel fitted to a shaft running in separate bearings under the traveling carriage. Chain wheels are fitted to this shaft, which drive in turn other chain wheels fitted to each of the axles, by means of forged wrought iron pitch chains.

The boiler is of the vertical type, 3 ft. 6 in. in diameter by 7 ft. high, having cross water tubes. The jib is of wrought iron, secured to lugs on the superstructure by wrought iron pins, the head being fitted with a chain sheave of very large diameter, which is bored and works on a turned pin.

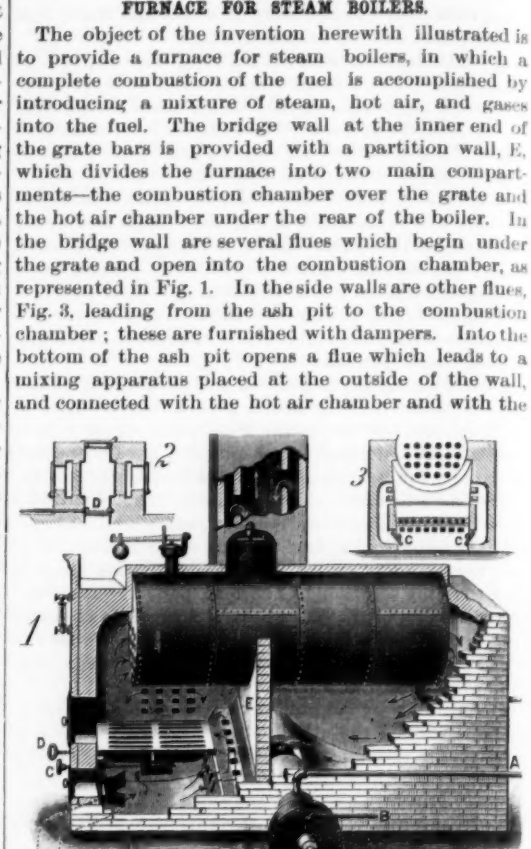
The crane is mounted on a substantial wrought iron framed traveling carriage mounted on wheels and axles for 4 ft. 8½ in. gauge, and cross girders are provided at each end for blocking up when lifting the maximum load sideways. The total weight of the crane in working order is 16 tons.—*Engineering.*



IMPROVED STEAM TRAVELING CRANE.

FURNACE FOR STEAM BOILERS.

The object of the invention herewith illustrated is to provide a furnace for steam boilers, in which a complete combustion of the fuel is accomplished by introducing a mixture of steam, hot air, and gases into the fuel. The bridge wall at the inner end of the grate bars is provided with a partition wall, E, which divides the furnace into two main compartments—the combustion chamber over the grate and the hot air chamber under the rear of the boiler. In the bridge wall are several flues which begin under the grate and open into the combustion chamber, as represented in Fig. 1. In the side walls are other flues, Fig. 3, leading from the ash pit to the combustion chamber; these are furnished with dampers. Into the bottom of the ash pit opens a flue which leads to a mixing apparatus placed at the outside of the wall, and connected with the hot air chamber and with the



HASECOSTER'S FURNACE FOR STEAM BOILERS.

chimney by a transverse channel through the bridge wall. Into the mixing apparatus, consisting of a fan rotated in any convenient way, opens a pipe, A, admitting steam; an opening also provides for the admission of air from the outside. The heating of the journal box is prevented by cold water admitted through the pipe, B. The transverse channel is provided at its entrance to the chimney with a damper, D, shown in the plan view, Fig. 2. On the three outer sides of the chimney are doors, one of which leads directly into the central chimney opening, while the others connect with vertical side flues, which communicate with the central openings through apertures, Fig. 1.

The heat of the fire enters the front end of the boiler flues, and, passing through them, enters the hot air chamber, from which it is drawn up the inclined bottom into the transverse channel by the suction of the fan and the draught of the chimney. The unconsumed products of combustion entering the chimney are drawn by the circulation set up by the fan, consisting in the air current from the fan, into the ash pit, through the passages into the combustion chamber, thence through the boiler and hot air chamber into the transverse channel and into the central open-

ing of the chimney. Other heated products, consisting of combustible gases and hot air, pass into the mixing apparatus, where they are mixed with steam and fresh air entering from the chimney. This mixture enters the ash pit, and part passes through the burning fuel and part enters the flues leading to the combustion chamber. Air from the outside enters the chimney by the side doors, and, after passing up the side flues, enters the central opening, down the outside of which it is drawn by the mixer. This furnace takes the combustible gases from the hot air chamber, and, after adding steam and air, forces them into the combustion chamber.

This invention has been patented by Mr. George Hasecoster, of Fifth and Chestnut Streets, St. Louis, Mo.

Good Advice.

The *Manufacturers' Gazette* relates of a Western railway company which gives the following advice to its employes gratis. It is applicable to employes in all parts of the country: "The servant, man or woman, who begins a negotiation for service by inquiring what privileges are attached to the offered situation, and whose energy is put chiefly in stipulations, reservations, and conditions to 'lessen the burden' of the place, will not be found worth the hiring. The clerk whose last place was 'too hard for him' has a poor introduction to a new sphere of duty. There is only one spirit that ever achieves a great success. The man who seeks only how to make himself most useful, whose aim is to render himself indispensable to his employer, whose whole being is animated with the purpose to fill the largest possible place in the walk assigned to him, has in the exhibition of that spirit the guarantee of success. He commands the situation, and shall walk in the light of prosperity all his days. On the other hand, the man who accepts the unwholesome advice of the demagogue, and seeks only how little he may do, and how easy he may render his place and not lose his employment altogether, is unfit for service; as soon as there is a supernumerary on the list he becomes disengaged, as least valuable to his employer. The man who is afraid of doing too much is near of kin to him who seeks to do nothing, and was begot in the same family. They are neither of them in the remotest degree a relation to the man whose willingness to do everything possible to his touch places him at the head of the active list."

NEW FRENCH CRUISER TONNANT.

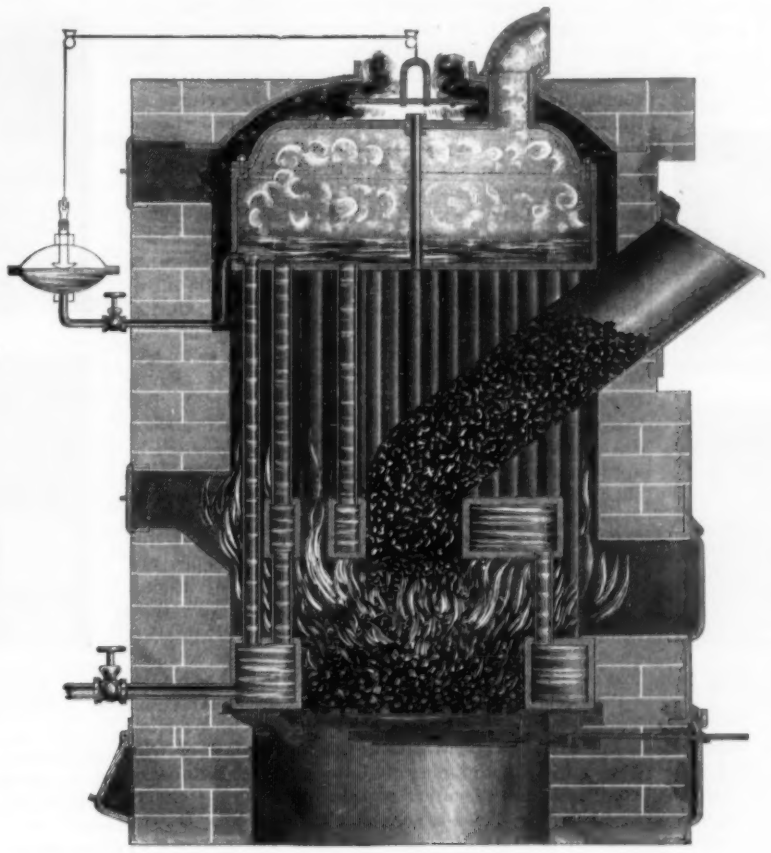
The illustration, which we take from our contemporary of Paris, *L'Illustration*, represents one of the newest types of French cruisers. It was launched at Rochefort in 1880, and is now quite completed and is ready to undergo its trial trips. Its armament consists of one heavy gun of 14 in. caliber in the turret and four smaller guns mounted on its forecastle. This formidable man-of-war measures 248 ft. at the water line; beam, 58 ft., with a depth of 18 ft., and having a draught of 16 ft. 8 in. Its displacement is 4,523 tons. Its armor amidships is 13 in., 10 in. forward, and 9¾ in. aft. The turret is also incased in armor, 14 in. in thickness. The Tonnant carries a crew of 197 men.

According to the new classification adopted for the ships of the navy, the fleet comprises 9 new cruisers, of which the Onondaga is the oldest, and dates from 1863. The Tonnant is the newest, and is the most perfect of all.

"IN the great fire which burned Murrey's Opera Hall, on Sept. 27, one large door, which was painted with H. W. Johns' asbestos fireproof paint, was the only wood that was not consumed."—*Albany, Wis., Vindicator.*

Metallic Ties.

The Vera Cruz railway, in Mexico, began using steel ties in 1884, and has now some 20,000 of them on its bed. So satisfactory has the experiment been, that 40,000 have been ordered from England for use this year, and it is proposed to put in from 40,000 to 50,000 per year hereafter. The "life" of a steel tie is considered as indefinite, but it may safely be set at from 30 to 50 years, the former being an American estimate by a competent metallurgist. The steel tie is now produced in England—where the manufacture has been so extended as to make the production very much cheaper than formerly—for five shillings apiece, or $1.25 gold. By chartering its own vessels, the Vera Cruz company can land its steel ties at a cost which permits their extensive use. It may be set down that the outside cost will not exceed $2 each, Mexican silver. The wooden ties which the steel ties are replacing on the Vera Cruz line range in price, according to the quality of wood, from 90 cents to $1.62, silver. The latter price is paid for the zapote tie, a very hard and durable wood. The best white oak ties last from five to six years, the red oak about three years. In India the steel tie, sent out from England, is displacing even the teak tie, one of the best woods, and the change is being made on the score of economy. In using the steel tie, expense of spikes is saved.



BRONSON'S MAGAZINE BASE-BURNING STEAM HEATING BOILER.

IMPROVED STEAM HEATING BOILER.

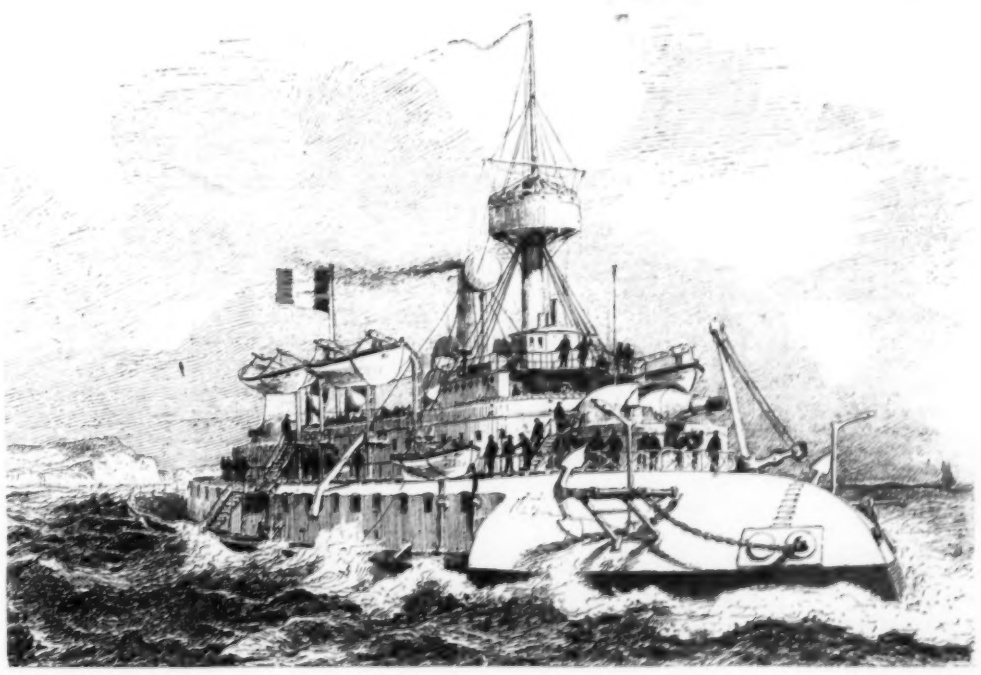
The accompanying engraving represents a steam heater possessing many features deserving attention. In the top of the heater, which is walled in, as clearly shown in the cut, is an annular water chamber, from the top of which leads the steam supply pipe. The fire pot is formed of an annular water chamber, which is connected with the upper one by an outer circle of tubes. Just above the lower chamber, and directly over the grate, is a third water chamber, which is connected by pipes with both the top and bottom chambers. The tube forming the coal magazine, which is inclined as shown, passes through the center of the middle chamber. This construction insures good steaming qualities, as every part of the pipes and chambers is exposed to the direct action of the heat, which, in its passage from the grate to the chimney at the top, is compelled by the arrangement of the pipes and chambers to take a circuitous route. This construction also provides a very perfect and rapid circulation.

Further particulars regarding this steam heater can be obtained from the inventor, Mr. William C. Bronson, of 676 Broadway, Saratoga Springs, N. Y.

Another Electric Motor.

A Third Avenue elevated car, brilliantly lighted with Edison incandescent lamps, recently made trips on the Thirty-fourth Street branch of the elevated railroad in this city. The car was filled with a crowd of interested electricians, for the Sprague electric motor was on trial. Notwithstanding the unfavorable condition of rain and a rusty track, the test was a successful one, and the fact that the car was both lighted, heated, and propelled by electricity, and that the station platforms were similarly illuminated, seems to show that comfort and rapid transit are both to be increased by the use of electricity.

The Sprague motor is carried on the truck of the regular car, and differs from all other systems in the fact that all its parts and movements are controllable by electricity. On this trial the speed of the car was made to vary from 23 miles an hour to a bare crawl. It stopped, switched, and reversed satisfactorily. No brake was used, the car being stopped by electricity. Stopping turns the motor into a generator, thereby saving much of the loss of electricity which happens in other systems. The electricity was supplied by two wires from a house half a mile away. Three tracks were employed, one wire being attached to the two outside tracks and the other to the middle track. The potential used was 600 volts. Mr. F. J. Sprague is the inventor of the new motor. His machine weighs only a ton, while the steam locomotives now in use weigh 20 tons. The motor is attached to each car, thus distributing the weight.



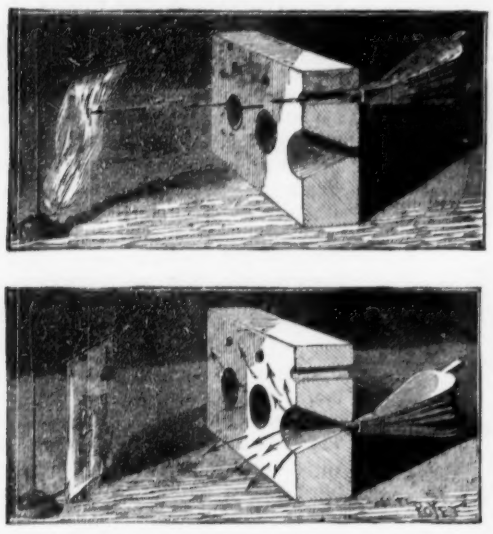
THE TONNANT—NEW FRENCH WAR STEAMER.

Sweetened Mortar.

A letter in the London *Times*, by Mr. Thomson Hankey, points out that cane sugar and lime form a definite chemical compound, which has very strong binding qualities, and forms a cement of exceptional strength. Equal quantities of finely powdered lime of a common kind and of good brown sugar, mixed with water, form a mortar which has been found to join stones and even glass with great success. It is important that the lime should be thoroughly air-slaked, for if any dry particles be left they will swell and eventually break the joint. It is stated that this mortar is equal in strength to Portland cement, and that the latter may probably be improved by the addition of sugar, or perhaps even of treacle. A number of small experiments which have been made have proved entirely successful, and it now remains to see whether the material offers advantages in actual work sufficient to pay for its extra cost.

ON THE AIRING AND LIGHTING OF HOUSES.

One of the greatest dangers against which man should provide in his dwelling is the confining of the air that he must breathe. It is not enough that the air that surrounds our dwellings be salubrious, but it is especially necessary that the internal air be not contaminated by any mephitic odors, and that we may breathe therein as in the open air. So the fundamental conditions that are necessary in order to have a healthy habitation may be summed up as follows: (1) that of having fresh air to breathe amid walls and furniture kept at a proper temperature; (2) that of receiving the full light of the sun, and of having the objects about ourselves amply lighted; and (3) that of having no dejections remain in the house.



Figs. 1 and 2.—EFFECTS OF AIR BLOWN THROUGH CYLINDRICAL AND CONICAL APERTURES.

Such conditions, hygienists have at all times endeavored to realize, but, in measure as human habitations have become more numerous and more closely packed, builders have the more and more neglected them. And yet, the proper sanitation of a house is the best means of warding off epidemics and all contagious diseases; for the example of all epidemic manifestations shows that it is in unhealthy towns, and in quarters that contain the foulest habitations, that these almost exclusively develop and spread. The great epidemics of past ages obtained their innumerable victims in those heaps of houses accumulated around the ramparts or under the churches and castles of our old cities. At present, it is under the same conditions that such scourges as cholera, typhoid fever, smallpox, and others make the most ravages; and these ravages they will continue to make until we succeed in improving such dwellings. Doctors Fodor and Rozsahegyi, after recently examining the houses of Buda-Pesth, from this point of view, have published the following results.

Out of every 100 houses the mortality was found to be

	Very clean houses.	Clean houses.	Dirty houses.	Infected houses.
Cholera	2	199	268	402
Typhoid fever	175	177	182	556

On another hand, there has been registered, per 10,000 inhabitants and for 15 years, the following mortality for the same city:

	Very clean houses.	Very dirty houses.
Cholera	90	430
Typhoid fever	162	515

Is not the cleanness of a house, moreover, connected with the conditions of hygiene that it presents?

Among the conditions that we have enumerated above, there are two to which we would now more particularly call the attention of our readers. The Exposition of City Hygiene, now open at the Loban barracks, back of the City Hall, furnishes the occasion to show various processes that have been devised in recent times for the sanitation of towns and dwellings; and the moment seems to be well chosen, then, for making known the principal arrangements.

As regards the airing of houses and apartments, it is obvious that an endeavor should be made to continuously introduce into the latter as much air as possible from the exterior, such air, whatever be the situation, being much more wholesome than that confined within doors. As for the evacuation of the air, that is effected through the chimneys and numerous apertures that our apartments are provided with. In a number of connected houses, it is effected through special apertures. Now, in each inhabited room it is the window that puts us most thoroughly in connection with the surrounding atmosphere; but although the panes of glass that close this let in an abundance of light (an indispensable condition for salubrity), their impermeability is such as to prove an obstacle to the entrance of air. So, in the various cases where there has been need of introducing air into inhabited rooms in such a way as not to incommode people, methods of all kinds have been tried to obviate the said impermeability. Hence the placing of casements at the upper part of windows, and hence, too, that innumerable variety of Venetian blinds with strips of glass, mica valves, opercula, etc. In England, where much attention has been paid to this subject for a certain number of years, an infinite number of all sorts of processes have been devised; but it was soon found out that these caused currents of air of more or less strength, that struck the heads of those occupying the rooms thus aired. Then the idea occurred to place ventilating bricks, provided with conical apertures, at the top of the walls, near the ceiling. The experiment shown in Figs. 1 and 2 explains the principle of this arrangement. When air is introduced by a bellows into a cylindrical conduit, a rectilinear current is produced which strikes in a direct line the objects placed in front of it, as shown in Fig. 1, where the little banner opposite the conduit is seen to be considerably disturbed. If, on the contrary, the bellows be introduced into a conical conduit having the same external orifice and a flaring internal one, the same quantity of air can be blown without causing the banner to budge, the air dispersing in all directions as soon as it emerges from the expanded mouth of the conduit (Fig. 2). The use of such bricks, however, is accompanied with some drawbacks. It is difficult to multiply them much in apartments; and, as it is not convenient to wash them, the conduits get full of dust, which easily contaminates the air as it enters. A few years ago the idea occurred to some one in Leeds to substitute for these bricks a sort of wooden cage placed before the windows, and containing quite a large number of small apertures connected with cylindrical glass conduits ending in small panes. This affair has an ugly appearance, and possesses the same inconveniences as those just mentioned.

Prof. Emil Trelat, of the Conservatory of Arts and Trades, has for a long time been teaching how advantageous it would be to have at the upper part of windows some panes of glass containing a large number of small apertures of conical section, in order to satisfy these important conditions of airing rooms. Messrs. Geneste & Herscher, on their side, being struck by these same advantages, endeavored to find some industrial process capable of furnishing glass so arranged.

The Messrs. Appert Bros., after numerous experiments, have finally succeeded in manufacturing perforated panes, such as shown in Fig. 5. The manufacture of such glass offers very great difficulties, as may be easily divined. We know, in fact, that, when we want to pierce a piece of glass in order to put finger-plates upon room doors, we have to use a steel rod, and pour turpentine upon the glass in order to renew the surfaces and render the biting of the steel easier. Sometimes we add oxalic acid, and even mashed onions. During this operation the plate is often broken.

Messrs. Appert, Geneste & Herscher's perforated panes contain 5,000 apertures per square meter. These apertures have a circular section of 3 mm. diameter, and are spaced 15 mm. from axis to axis. The glass is 3·5 mm. thick. Other panes, a little thicker, have 4 mm. apertures spaced 20 mm. from axis to axis. By special, patented processes, the Messrs. Appert have succeeded in surmounting all the great difficulties that this industrial problem presented, and

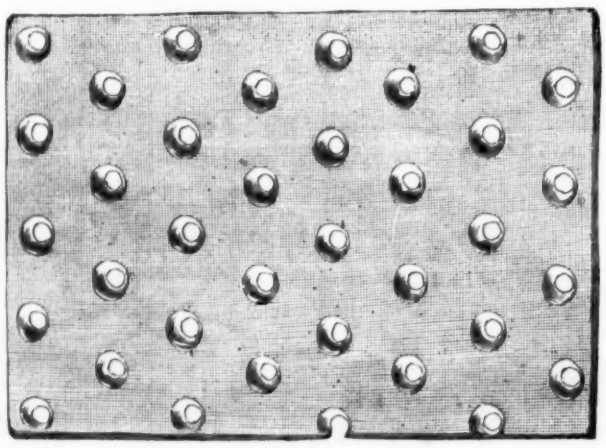
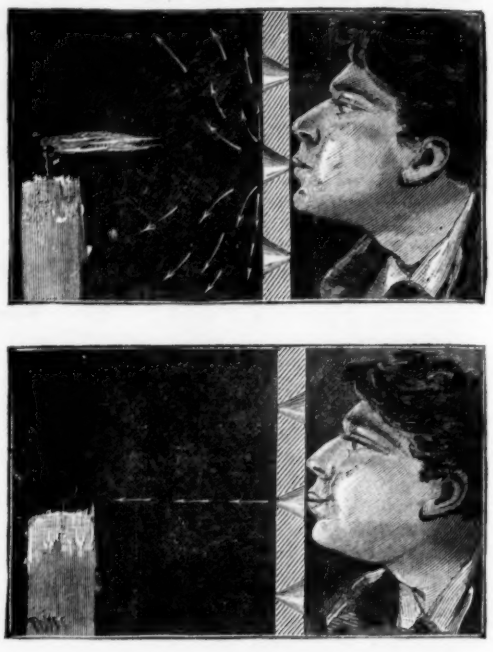


Fig. 5.—PERFORATED GLASS.

their perforated glass now stands as a very remarkable specimen of recent progress in the art of glass making.

From the point of view that now specially occupies us, it must be remarked in the first place that these window panes have a surface of three square decimeters per square meter open to the external air. Moreover, as the apertures open out in the interior, the currents of air expand upon entering the room. Prof. Trelat, to whom belongs the merit of having brought about the manufacture of this glass and of having shown its great value for airing dwellings, rightly recommends that it be not placed at less than 2·5 m. (8¼ ft.) above the ground, in order that the currents of air that enter shall not incommode the occupants; so that it is especially useful in all high rooms, and chiefly in apartment houses, school rooms, hospitals, dormitories, churches, and so forth. It has the advantage that it never becomes obstructed, since all the panes of the window are necessarily washed, and for this reason the air that traverses them does not become charged with any impurities. As the panes are made of translucent, not



Figs. 3 and 4.—EFFECTS OF BLOWING AIR THROUGH A CONICAL APERTURE IN BOTH DIRECTIONS.

transparent, glass, they keep neighbors across the way from peering in. These perforated panes may likewise be profitably employed in rooms not so high and in our apartments, provided that they be so arranged that their open surface can be covered at times—this being easily done by means of a movable frame. Figs. 3 and 4 represent an easily reproduced experiment, by means of which is shown how this glass imperceptibly effects the airing of an inhabited room. If we blow in the direction of the small aperture toward the larger, the air will expand along the sides of the cone, and, on making its exit, will form a back-draught behind the candle opposite; while the candle will be at once extinguished if we blow in the opposite direction, the air in this case proceeding straight ahead and with force.

Prof. Trelat does not confine himself to professing that fresh air should be introduced, permanently and as much of it as possible, into living rooms, and that to this end it is well to provide the upper parts of windows with perforated glass; but also insists upon the necessity of introducing into rooms light that comes directly from the sky, at least during such times of the day as they are occupied. In fact, he has for a long time been the resolute partisan of a unilateral lighting of our school rooms, in which one of the sides of the room would contain broad glazed windows for giving light, and the other would contain bays for airing, to be opened only at night and during recess. As well known, artists accord peculiar qualities to lighting effected in this way. Prof. Trelat proposes to transform our usual internal arrangements, and make the upper part of windows entirely free. In one of the halls of the Exposition may be seen a window draped in this way by means of a rich curtain due to Mr. Penar, a skillful upholsterer. The light in this hall is certainly very agreeable, and of such a character as never to injure the most delicate sight, even after prolonged work in it. It remains to be seen whether fashion will adopt an arrangement for draperies whose elegance can certainly not be denied. However this may be, the question is put, and Prof. Trelat, whose proposed arrangements are shown in Fig. 6, will at least have done the service of pointing it out and solving it.

Prof. Trelat, whose models, made in conjunction with Mr. Gaston Trelat, are shown in Figs. 8 and 9, likewise insists upon the necessity of setting houses in different positions in northern and southern countries. It is well known how too much given we are to making everything uniform in our country. For example, we observe the same mode of construction adopted in our barracks at Dunkirk, Bayonne, Brest, and Toulon, just as if the climatic features were everywhere the same. Now, in order that the heating of the structure be equally distributed throughout all the materials, and that the rays of the sun may penetrate the rooms deeply, it is necessary that, in the north, the house shall be directed east and west, while, on the contrary, it should be north and south if it be desired in southern

GOOD LIGHT WITHOUT VIEW. LIGHT AND VIEW. NEITHER LIGHT NOR VIEW.

Fig. 6.—HOW A ROOM SHOULD BE LIGHTED.

lands to suppress the injurious action of the solar rays of the morning and evening.—*La Nature.*

Jarrah Wood.

Jarrah wood (*Eucalyptus marginata*) is a product of Western Australia, where it is found in considerable abundance. Mr. Thomas Laslett, Timber Inspector to the Admiralty, in his valuable work, "Timber and Timber Trees, Native and Foreign," says of it: "It is of straight growth and very large dimensions, but, unfortunately, is liable to early decay in the center. The sound trees, however, yield solid and useful timber of from 20 feet to 40 feet in length, by 11 inches to 24 inches square, while those with faulty centers furnish only indifferent squares of smaller sizes or pieces unequally sided, called flitches. The wood is red in color, hard, heavy, close in texture, slightly wavy in grain, and with occasionally enough figure to give it value for ornamental purposes; it works up quite smoothly, and takes a good polish. Cabinet makers may, therefore, readily employ it for furniture; but for architectural and other works, where great strength is needed, it should be used with caution, as the experiments prove it to be somewhat brittle in character. Some few years since a small supply of this wood was sent to the Woolwich Dockyard, with the view to test its quality and fitness for employment in shipbuilding; but the sample did not turn out well, owing to the want of proper care in the selection of the wood in the colony."

The clerk of works at Freemantle, in reporting upon the opinions expressed by shipbuilders and others, says: "The sound timber resists the attack of the *Teredo navalis* and white ant. On analysis by Professor Abel, it was found to contain a pungent acid that was destructive to life. The principle, however, was not found to be present in the unsound portions. Great care is therefore necessary in preparing the wood for use by flitching the log so as to cut all the defective portions of the heart out, and using only the perfectly sound timber."

Very much has been said about jarrah being subject to split when exported to England in log. It must be borne in mind that its density renders seasoning very slow, and that the inner portions of the larger trees are often in a state of decay, even while the outer portions are in full vigor. A tree under these conditions, the inner portions comparatively dry, and the outer full of sap, shipped at once to such a variable climate as that of England, very naturally bursts from unequal shrinkage, being also exposed to very great changes of temperature. To obviate this peculiarity and apparent defect, let the jarrah be fallen when the sap is at the lowest ebb, and carefully flitched, as previously suggested.

The methods adopted in seasoning jarrah are as follows: The logs are thrown into the sea and left there for a few weeks; they are then drawn up through the sand, and after being covered with seaweed a few inches deep, are left to lie on the beach, care being taken to prevent the sun getting at their ends. The logs are then left many months to season. When taken up they are cut into boards seven inches wide, and stacked so as to admit of a free circulation of air round them for five or six months before using them.

In a communication forwarded to India by H. E. Victor, Esq., C.E., of Perth, in reply to inquiries made by some gentlemen engaged in the carrying out of several large contracts for public works in India, he says: "Undoubted authority is unanimous in declaring that the timber of the jarrah, under certain conditions, is indestructible."

Professor Von Mueller, Government Botanical Director of Victoria, says: "Its wood is indestructible; is attacked neither by chelura, teredo, nor termites, and is therefore much sought after for jetties and other structures exposed to sea-water. Vessels built with this timber have been enabled to do away with all copper-plating. It is very strong, of a close grain, slightly oily and resinous in its nature, works well, takes a fine finish, and is, by shipbuilders in Melbourne, considered superior to oak, teak, or any other wood for their purpose."

The committee of Lloyd's, after the representations of His Excellency Governor Weld, determined to rank this timber with those in line 3, Table A, of the Society's rules; thus ranking it with *Cuba sabicu*, pencil cedar, etc., for the construction and classification of ships. The purposes to which jarrah may be applied are innumerable; it fills the place where saul and teak could not be admitted, as well as where they are used; and as the material can be supplied at a price considerably less than the timbers named, in the log, and at half their price in scantling, it should be employed where hitherto timber has been considered undesirable—for instance, in sea-facing, dock-lining, landing-stages, breakwaters, and beacons; curbs, road-paving, block-flooring, weather-boarding, and wainscot partitions, wallings, ceilings, and roof coverings.

A Western Australian almanac says: "None of the neighboring colonies possess timber of a similar character to the jarrah, or endowed with equally valuable properties. If cut at the proper season, when the sap has expended itself and the tree is at rest, it will be found the most enduring of all woods. On this condition it defies decay; time, weather, water, the white ant, and the sea worm have no effect upon it. Specimens have been exhibited of portions of wood which had been nearly thirty years partly under water and partly out. Others had been used as posts, and for the same period buried in sand, where the white ant destroys in a few weeks every other kind of wood. For this peculiar property the jarrah is now much sought after for railway sleepers and telegraph posts in India and the colonies. It is admirably adapted for dock gates, piles, and other purposes, and for keel pieces, keelsons, and other heavy timber in shipbuilding. Vessels of considerable burden are built entirely of this wood, the peculiar properties of which render copper-sheathing entirely unnecessary, although the sea worm is most abundant in these waters."

Though in the foregoing there are a diversity of opinions, yet the general tendency is to testify to the usefulness in an extraordinary degree, under stated conditions, of jarrah wood, and the practical mind will quickly see many opportunities for taking advantage of a wood possessing so many valuable qualities as this wood has been found to contain; and it is not saying too much to express a hope that the shipments now in the London docks will be but the prelude to many other, and more important, consignments to this country, where intrinsic merit is the only passport necessary to gain public favor and support where commercial interests are concerned.—*Building News.*

GOOD LIGHT WITHOUT VIEW. LIGHT AND VIEW. NEITHER LIGHT NOR VIEW.

Fig. 7.—HOW A ROOM SHOULD NOT BE LIGHTED.

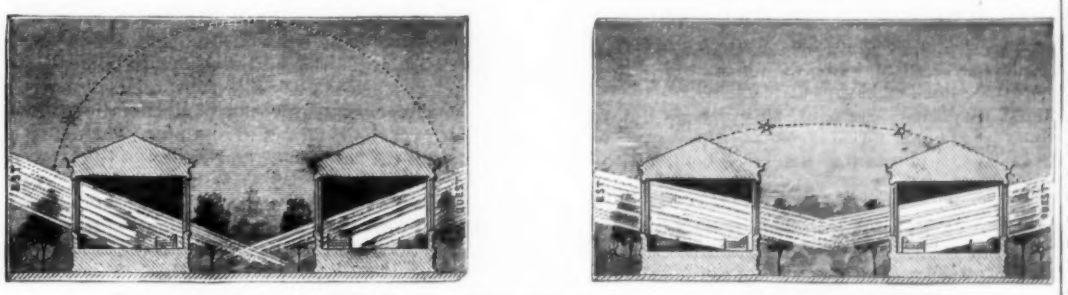


Fig. 8.—DIRECTION IN WHICH BUILDINGS SHOULD BE SET IN NORTHERN COUNTRIES.

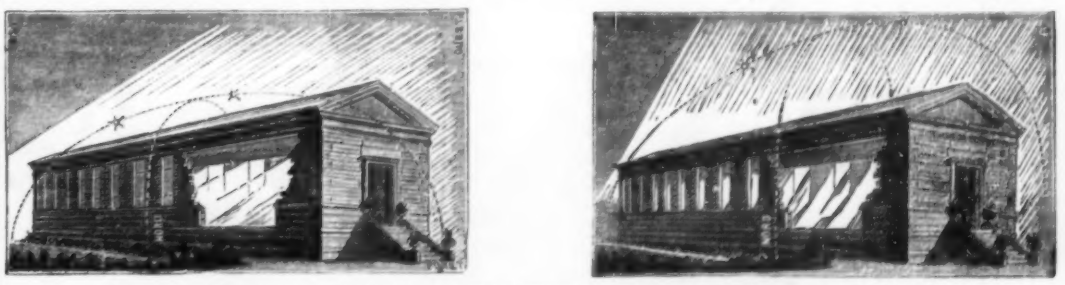


Fig. 9.—DIRECTION IN WHICH BUILDINGS SHOULD BE SET IN SOUTHERN COUNTRIES.

St. Sophia, Constantinople.

St. Sophia at Constantinople, of which at last authentic particulars have been obtained in the work of Salzenburg of Berlin, who, taking advantage of the scaffoldings erected by Fossati for the repair of the building, measured carefully every part of it. From this it appears that the diameter of the drum of the dome is 100 Prussian feet, or 102 feet 11 inches English, but the dome itself is 4 feet more, or 107 feet in diameter. It is constructed of forty ribs, projecting each 2 feet, which die away toward the center, leaving about one-third of the dome perfectly plain. The form is segmental, 45 feet 6 inches in height, and described consequently from a point about 8 feet below the springing. Round the base are forty windows, which throw in a flood of light; and altogether its appearance internally is as beautiful as any I know of. Originally, it was even flatter than it now is; but being in that form beyond the constructive power of its architect, it fell in, and the present form was adopted; but even then the architect tried to keep it as low as possible, judging correctly that the flatter it was the greater would be its apparent size, and also that of the floor it covered, and all of the parts around it. To obtain these internal advantages, however, the architect sacrificed the exterior entirely, and it is on the outside perhaps the ugliest dome ever constructed. But the same remark applies to the whole church. No pains whatever seem to have been taken with the exterior, though every part of the interior is designed with the greatest care, and ornamented with the most profuse liberality.—*J. Fergusson.*

Swiss carved work in whitewood affords excellent opportunities for hand-painting, and many pretty articles for home decoration can be made from it.

The Electro-Osteotome.

Dr. Milton J. Roberts, of this city, a distinguished surgeon, is the author of the new mode of examining diseased bones, which consists in boring into and lighting up their interior surfaces with the electric lamp. He describes his devices as follows: My aim has been to make as nearly a universal osteotome as possible; that is, an instrument with which the surgeon can cut bone with ease, safety, and accuracy in any desired direction. The instrument which I have elaborated is called the electro-osteotome.

As it is now constructed, it is provided with two headpieces, one for the carrying of various sizes of circular saws, and the other for the holding of drills and burrs of various shapes and sizes. By means of this instrument, a bone may be perforated with any size drill up to a quarter of an inch in diameter, or a cross or longitudinal section of it made with as much facility as a similar wound could be made in the soft parts by means of a sharp scalpel.

For the early positive diagnosis of the existence of diseased bone, the instrument is provided with very fine drills, from the one sixteenth to the one thirty-second of an inch in diameter. These drills are constructed, not after the form of the ordinary twist drill, but upon the principle of a cheese tester; that is, they have a longitudinal groove on one side. By means of such a drill, a plug or sample can be removed from any suspected area of bone. No incision through the soft parts is necessary. The drills revolve at a very high rate of speed, and readily penetrate the soft parts and bone. Upon removal of the drill, the debris lodged in the groove is placed upon a glass slide and examined under a microscope. If there be commencing ostitis, the characteristic findings will be manifest. Of course, when drilling into the head of a bone, and a cavity or soft spot is reached, the sensation communicated to the hand will be all that is desired to establish the fact. The use of the drill in this manner is analogous to the use of the hypodermic needle in the soft parts for diagnostic purposes. If no disease exists, no harm is done by means of the puncture.

Once having thus positively determined the existence, site, and probable extent of disease, an incision is made down to the bone, and a large drill or trephine, from a quarter of an inch to half an inch in diameter, is carried through the bone into the diseased area or cavity. Upon removing this, smaller drills or burrs may be passed in through the opening thus made, and used to excavate the affected bone.

For the thorough inspection of the parts, I have had constructed a miniature incandescent lamp, so small as to readily pass through a quarter inch drill hole. These lamps (half candle) furnish sufficient light to thoroughly illuminate the interior of any bone cavity.

DOUBLE DREDGER.

The engraving below represents one of Priestman Brothers' double self-contained dredgers, and is taken from a photograph, in South American waters. The dredger is somewhat novel in its construction, being the first of the kind which has been made. A large steam hopper dredger has been fitted with four of Priestman's machines, made to the order of the Mersey Docks Board, and can be seen working in Liverpool or Birkenhead docks; but this particular dredger, although suitable for all kinds of dock and harbor work, was specially designed for exportation. It forms part of an order for the Brazilian Government for carrying out harbor improvements in the port of Maranham, where it is required to deepen the channel and deposit the dredgings behind the breakwater for reclamation purposes. The two dredgers shown are each capable of lifting from fifty to eighty tons of material per hour, in accordance with the nature thereof, being fitted with strong interlocking steel-faced grabs—see Figs. 1 and 2—suitable for hard sand, clay, or mud, gravel, etc., each of which, when filled, holds about 40 cwt. of deposit. The steam is taken from a multitubular boiler, 9 feet long by 8 feet diameter, having a heating surface of 386 feet, and is conveyed to the engines through steam passages up the center columns of the respective machines. The barge is constructed to facilitate transit and erection abroad, and is made in eight longitudinal sections, being plated, riveted, and calked in the makers' yard in Hull; each end of each several

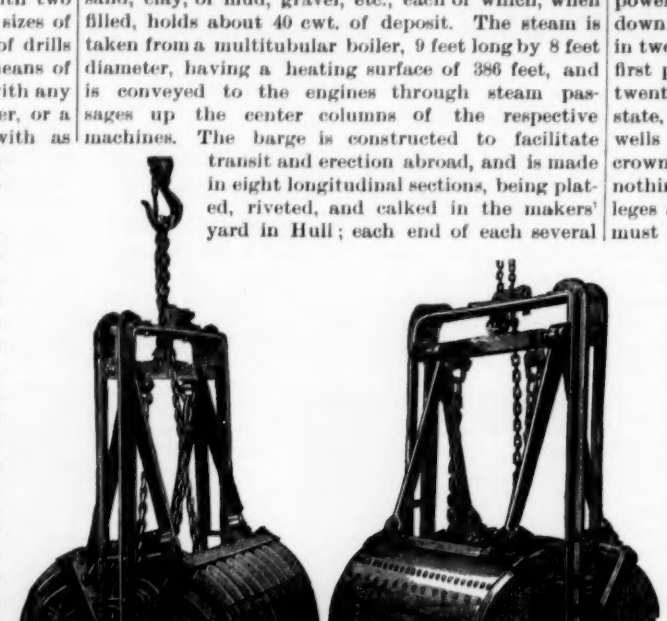


Fig. 1. Fig. 2.

section being supplied with strong angle iron frames, forming at the same time flanges for bolting or riveting the several sections together. The decks are of timber.] The rubbing belt, deck planking, stringer plate, and keelsons are made to cross the joints of the several sections, to increase stability. The dimensions of the barge are 60 feet in length by 22 feet beam, and 6 feet deep, with flat bottom, rounded ends and bilges, to increase buoyancy in the water when the dredgers are at work. The rest of the order comprised four iron barges, constructed in a very similar manner to the above, 48 feet long by 15 feet beam, and 6 feet deep, to carry the deposit raised by the dredgers, and two of Priestman's portable bucket elevators, each capable of lifting about fifty tons per hour, with wheels for running upon the quay for discharging the barges of their dredgings, and placing the same behind the breakwater.—*The Engineer.*

A Russian Petroleum Pipe Line.

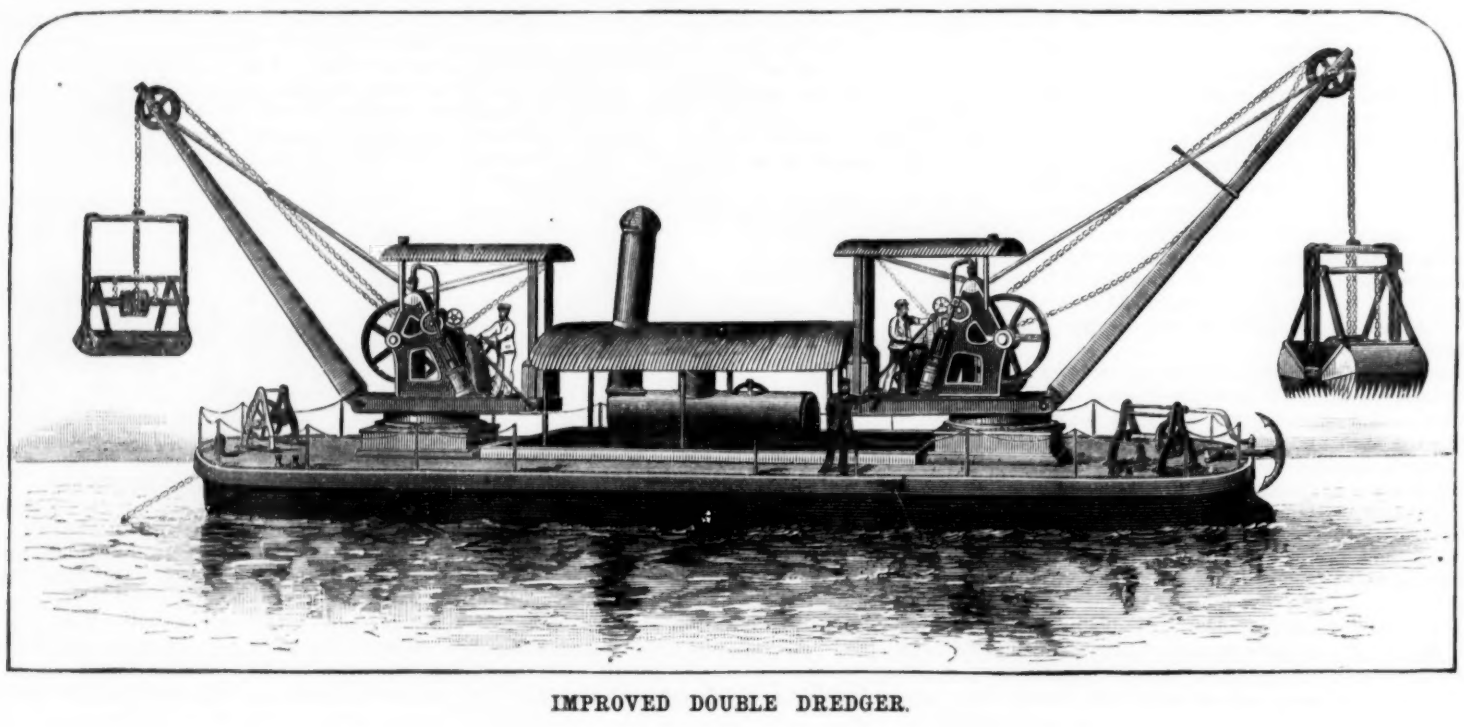
In the London *Pall Mall Gazette* of October 8, Mr. Charles Marvin, who has written much concerning the Russian petroleum wells and refineries, has the following concerning the long contemplated project of a pipe line across the Caucasus, whereby petroleum is to be carried to the shore of the Black Sea at a very low cost:

The Russian government has completed at last the scheme for the petroleum pipe line from Baku to the Black Sea, a distance of nearly 600 miles. The capital required for the scheme is £2,000,000.

The pipe must be large enough to allow of the passage of 160,000,000 gallons of oil a year, and the stoppages for repairs must not exceed on an average one a month, or last longer than three days. As soon as the traffic reaches 90 per cent of the full working power of the line, the company must proceed to lay down a second oleoduct, and have it ready for traffic in two years. The time allowed for laying down the first pipe line is three years. The concession will last twenty years, but no guarantee will be given by the state, nor will the company be allowed to own oil wells and refineries. Where the pipe line traverses crown estates, the land will be given the company for nothing, and elsewhere it will enjoy the same privileges as railway corporations. One-third of the pipes must be obtained in Russia, but this clause will not be insisted upon should the supply be inadequate. The tariff to be charged for the oil pumped through the line is 10 or 11 copecks the pood, or 12s. or 13s. a ton. This will amount to a little more than a halfpenny (1 c.) a gallon. The engineering obstacles to the enterprise are of a very trifling character, with the exception of the passage of the pipe line over the Lesser Caucasus. The ascent to the Suram Pass, 3,200 feet above the sea level, is somewhat sharp, but an extra number of powerful pumping stations will overcome this obstacle, while on the Batoum side of the range fewer stations will be needed, owing to the force with which the oil will flow, by its own gravity, to the Black Sea coast. There is, therefore, no reason for fearing that the pipe line will not be laid down in three years' time, perhaps considerably earlier. As for the distance, it is a mere trifle compared with the American pipe lines, which collectively extend to a length of 9,000 miles. When it is open for traffic, the export of Russian petroleum *via* the Black Sea will increase tenfold, and there will be a terrible tumble in the price of American oil in Europe. At present, tens of millions of gallons of refined petroleum can be had at Baku for a penny a gallon. The projected pipe line will run it across to the Black Sea for another halfpenny, and for very little more than that sum it will be possible to bring it to London in tank steamers. In this manner, whether England makes the pipe line or not, she will derive a substantial benefit by its completion.

Comstock Deep Mining.

"Orders have been received from San Francisco to stop all work in the Chollar mine, and to immediately strip all levels below 2,400 feet. The orders also necessitate the immediate suspension of all operations in the lower levels of the Hale & Norcross mine. This action is the result of the flat refusal on the part of the trustees of the Savage mine to pay their one-third proportion for keeping the pumps in motion at the combination shaft. The lower levels in both mines will be abandoned and flooded as soon as the ponderous pumps are shut down. The stoppage of work in these mines throws several hundred men out of employment and, it is believed, sounds the death knell of deep mining on the Comstock."



IMPROVED DOUBLE DREDGER.

THE TARSIERS AND LORISES OF THE MALAY ARCHIPELAGO.

The forests of the East Indies are populated by strange animal forms, among which the curious Lemuridæ that are figured herewith, from a drawing by Mr. Clement, are deserving of occupying the front rank. These odd creatures, the analogues of the galagos of Africa and of the indris and cheirogales of Madagascar, are, with the *Galeopitheci*, or flying lemurs, the representatives, in the Indo-Malaisian region, of the order Lemuridæ, which are inhabitants of the tropical regions of the Old World, and the fossil remains of which confirm their existence at the Tertiary epoch in France and North America.

These animals represent transitory forms between the monkeys and cheiroptera, but are more widely separated from the former than from the marsupials, with which they have very great affinity, and from which they appear to have originated. Taking as a basis the present geographical distribution of these creatures, certain English and German naturalists have tried to find the possible ancestors of the monkeys in the Lemuridæ; and, starting from man, have assigned as the home of these ancestral forms an immense and now submerged continent of which Madagascar and the Malaisian islands are the last vestiges. These views are hazardous at the best, and, while there is nothing to demonstrate the truth of them, a large number of facts can be adduced against them. It can be proved that the various types of Lemuridæ were, at the time of their appearance, distributed throughout distinctly defined regions. The Tertiary epoch shows us forms of them in the temperate parts of the Old and New World. In the phosphorites of Quercy Mr. Fithol has collected the remains of *Nacrolemur antiquus*, a lemur closely allied to the present pottos of West Africa. "Their burial in the phosphatic fissures," says Mr. De Lapparent, "appears to have been immediate, and doubtless under the influence of noxious vapors that asphyxiated such animals as had come to slake their thirst at the springs; for there are many entire skeletons, and the bones of neither the ruminants nor rodents show any trace of incisions made by the teeth of the carnivora with which they are associated."

Other geologists have exhumed from the lower Eocene of Wyoming Territory the remains of *Limnotherides* and *Lemuraoides* of whose natural affinities with the makis there is no question. At the beginning of the Eocene period there existed other animals, whose bones, collected in the Montmartre gypsums, leave scientists in uncertainty as to the exact place to which they ought to assign the owners of these remains in the mammalogical series. Some regard the *Adapides* as ungulate mammals, while others would place them among the Prosimians, to which a large number of their characters tends to ally them.

If we take the proofs that unite to give us the geological and geographical distribution of the Lemuridæ, our mind is made certain. Far from looking for the probable origin of the primates in these creatures, we must, on the contrary, consider them as a special type that has been clearly characterized from the most ancient time, and that is due to modifications introduced into certain marsupials. The thumbs opposite the other fingers is not a character that can be called upon to approximate these animals to the monkeys, for this peculiarity is observed in a large number of marsupials, and, properly speaking, cannot be considered as a mark of superiority. It is even remarked that certain monkeys are destitute of it, such as the catarrhinians, of the African genus *Colobus*, which lack the thumb on the hands. The hand must not be considered as a modification of the foot, but rather as an organ of special and primitive plan. Certain naturalists have considered, and do still consider, the thumb as a continuation of the axis of the arm represented by the radius. It seems more reasonable, along with Carl Vogt, to look at it "rather as a secondary radius independent of the other fingers, and which, for this reason, is generally the first to disappear when the number of the fingers is reduced."

The tarsier, shown at the lower part of the engraving, seems, through its fantastic appearance, to well merit the name *spectrum* given it by Geoffroy Saint-Hilaire. To consider but its stature and proportions, its long hind limbs, and its still larger tail, ending in a tuft, this tarsier might be taken for a jerboa, were it not for the inordinately large round eyes with which its head is provided. These eyes, which are of a yellow brown, are luminous in the dark, and, according to one observer, give the head the appearance of a dark lantern with two bull's eyes that revolve upon a pivot.

TARSIERS AND LORISES.

The accompanying figure shows the tarsier reduced to about one-third of its natural size. The length of the adult's body is about 6 inches, and that of its tail 9 inches. The body is covered with a woolly fur of a grayish brown, lighter upon the belly. The trunk is slim, and the long tail that terminates it is cylindrical, and is provided at the tip with a tuft of hairs. In the abdominal limbs, the first two divisions are nearly of equal length. The thigh is stouter than the leg, and the latter terminates in a very slender tarsus, and a foot whose toes are still more elongated than the fingers, and which is provided with a strong toe that can be placed opposite the others. Of the toes, the second and median end in a claw, while the very long fourth one and the fifth one, like the fingers, are provided with flat nails. It must be remarked, however, that the nails of the hand are more convex than those of the foot. The toes end in a disk, and their lower surface is provided with round callouses, by means of which the animal fixes itself firmly in position.

The thoracic limbs, which are much shorter, terminate in a hand composed of long, slender fingers, provided with disks. The thumb, which is short, cannot be moved opposite the other fingers.

The head is large and round, the muzzle is short pointed, and the ears are of medium length, naked, and provided with a sort of fold by which they can be closed. The eyes take up more than half the face; and the mouth, which is capable of opening very widely, does not contribute to increase the animal's beauty, and seems to contract into a diabolical grin.

The dental formula ($\frac{2}{2}\ \frac{1}{1}\ \frac{3}{3}\ \frac{3}{3}$) is that of an insectivore, and is nearly identical with that of the bats of the genus *Plecotus*, and likewise recalls that of the indris of Madagascar. "In the upper jaw," says Vogt, "the incisors, canines, and premolars have nearly the same form of sharp fangs, the median incision is more prominent, the second is smaller, the canine is stronger, the first premolar is very small, the second is larger, and the third has two points. The molars are wider than long, and are provided with sharp external tubercles. In the lower jaw, the strongest teeth are the canine; the incisors are small and straight; and the premolars increase from in front backward."

The spectral tarsier inhabits the Sunda, Celebes, and Philippine Islands and, according to Brehm, the Moluccas, and principally the island of Amboyna.

It has never been permitted me to see this Prosimian in a living state, and the specimens that I was enabled to see or procure during the course of various voyages among the islands of Malaisia were either preserved in alcohol or stuffed. It is, moreover, an always rare animal, that lives in couples in thickly wooded and the least accessible places in the virgin forests. During the day it remains in deep slumber. At the approach of night it is seen running nimbly, making long leaps from branch to branch, and pursuing and greedily devouring insects. It feeds on fruit also, but its most usual diet consists of articulates and simple reptiles.

The female gives birth to one offspring, which fastens itself to her thighs, or which she sometimes carries with her mouth, after the manner of cats.

The Malays seem to have a singular dread of this animal. Owing to its strange physiognomy, they appear to regard it as some supernatural and malevolent creature that takes pleasure in casting a spell over men and their possessions. They even carry their simplicity so far as to abandon the fields where the animal shows itself by chance, thinking that it is better to bear the fatigue of clearing other land than to expose themselves to the witchcraft of the little devil. Yet there are few creatures so inoffensive as these little Lemuridæ, and those that have been observed in confinement have never displayed any ill nature—the most that they have done being to make some impatient movement when awakened in the middle of the day. In a wild state they pass the day coiled up asleep in the hollows of trees or in the forks of the branches.

The slender loris (*Loris gracilis*, Van der Hoeven) has the same habits as the tarsier, and, like it, inhabits the large Sunda Islands. But its geographical range is much wider at the north, and although it is frequent in the forests of India and Indo-China, it does not appear to inhabit the Celebes and the Moluccas. It is rare in Malaisia and is replaced by an allied form, the *Nycticebus*, of which two species are known, *N. java-*

nicus, Geof., and *N. tardigradus*, L. Like the tarsiers, the lorises have large eyes which shine in the dark; but they have merely a short rudiment of a tail. At the top of the engraving are represented two of these animals. One of them is preparing for a frolic, while his companion is still in deep slumber. I have observed this animal while it was asleep, and the engraving well shows its usual attitude.

The slender loris is 10 inches in length. Its dental formula ($\frac{2}{3}\,\frac{1}{1}\,\frac{3}{3}$) slightly approximates it to the carnivora, whose diet it shares. Its greatest treat is birds, which it seizes in the dark and devours the brain of. It is looked upon with an evil eye by the aborigines of the countries that it inhabits. The Ceylonese catch the poor animal, and torture it most cruelly. "The beautiful, large, bright eyes of the loris," says Tennent, "have attracted the attention of the aborigines, and it is for the possession of these that they hunt the animal. These organs enter into the preparation of certain love potions. In order to extract them, the natives hold the poor beast over a fire until the eyes burst." The same author adds that the slender loris is so fond of birds' brains that, according to the natives, it will attack the pea fowl while the latter is asleep, quickly crush its skull with its teeth, and then feast upon the contents. Like the tarsier, the loris does not appear to be able to live in Europe, and those that an endeavor has been made to introduce in menageries have died during the trip.—*M. Maindron, in La Nature.*

THE CYCLORAMA.

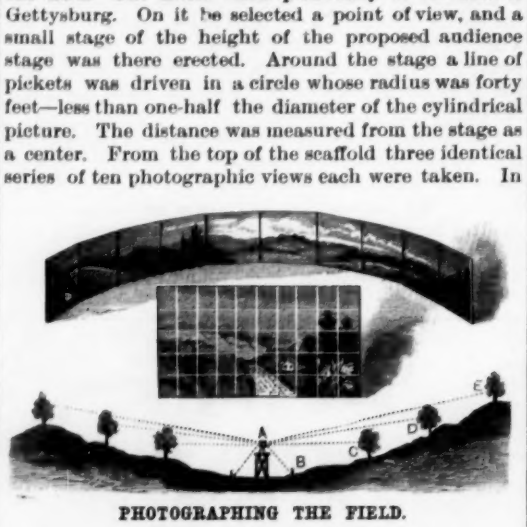
The origin of this form of art is fancifully traced to the use of scenery by the Italians, two or three hundred years ago. They arranged, outside of their windows, scenes painted on canvas, that simulated extensive gardens. The American inventor, Robert Fulton, is said to have exhibited a panorama in Paris in the beginning of the present century. This was probably paintings of a series of scenes on a continuous canvas wound on rollers, and caused to pass across the stage. The circular or cylindrical painting, properly called a cyclorama, whose perspective is a matter of special calculation, and which is celebrated for its illusive effects, is more recent. It probably does not date back over fifty years.

A cyclorama has, within a short period, been placed on exhibition in Brooklyn, illustrating the battle of Gettysburg. Irrespective of its artistic merits, which are very great, the technical details of its construction and the solution in it by means of photography of the problems of cylindrical perspective alluded to above possess much interest. The painting is contained in a large circular building on the City Hall Square.

The work covers a sheet of canvas four hundred feet long and fifty feet high. This is supported from the sides of the building so as to form a cylinder. A rail or beam of iron and wood combined is carried all around the upper part of the building like a cornice, resting on brackets. The upper edge of the canvas is nailed to this. The cloth is first rolled smoothly on an iron roller surfaced with wood, fifty feet long. This roller is about three feet in diameter. It is held vertically in a heavy framework that runs on tracks around the building. From the roller thus carried, the cloth is gradually paid out, eight or ten men being required, some on top and some below. As fast as it comes off the roller, it is seized and held in pincers by one of the operatives, and its edge is tacked to the cornice beam.

This disposes of the upper edge. The lower edge is fastened to a circle of gas pipe, that runs completely around the building, and that is carried entirely by the cloth. At every third foot a twenty-five pound weight is hung, to stretch the canvas. The effect of the stretching is that the canvas loses the true cylindrical shape; its sides are no longer parallel, but curve slightly inward, about one foot in amount, at the center. Thus at the horizon line, the most distant part of the scene, the painting is about a foot nearer the vertical line, through the observer's position, than in the foreground. In absolute distance from his eyes the difference is still greater. Owing to obliquity of the line of sight, the foreground, that seems so near at hand, is really much further off than the horizon.

The next operation to be described is the painting. This was carried out in this particular cyclorama so as to secure almost absolute accuracy. The landscape is really an artistic transcript of photographic views of the field. The artist went personally to the field of Gettysburg. On it he selected a point of view, and a small stage of the height of the proposed audience stage was there erected. Around the stage a line of pickets was driven in a circle whose radius was forty feet—less than one-half the diameter of the cylindrical picture. The distance was measured from the stage as a center. From the top of the scaffold three identical series of ten photographic views each were taken. In



PHOTOGRAPHING THE FIELD.

taking them, the instrument was newly pointed for every view, so that the entire horizon was covered. Each series shows the whole field of view in all directions. The arrangements were such that the line of pickets came just within the field. One series of photographs was taken for the foreground, focusing and exposure being adjusted for this special portion; two other series, identical in all respects except that by their focusing and exposure they were devoted to middle distance and background respectively, completed the set. The only difference between the three series was in the focusing and exposure. Each view was divided up into squares. The canvas was marked off by corresponding divisions and the photographs were copied square by square. This blending of the ten views and the aerial perspective was a question of artistic achievement. The out lines were determined, to a great extent, mechanically.

The painting was done from scaffolds, of which a number were used of different heights. These travel on the same track that carries the roller frame. The painting is in oil, tinsel being occasionally employed with excellent effect. Bayonets or equipments and bursting bombshells afford instances of its use. The artist personally did practically all of the work, the sketching and artistic details, besides attending to the superintendence of his aids.

The circular wall being thus covered, the foreground has next to be attended to. By platforms and earth this is built up irregularly and to a greater or less extent toward the center. Earth and sod cover the boards. Real trees, evergreens and others, with shrubbery, portions of fences, and the like are set about, and tufts of grass, wheat, and similar things, lend their aid to fill up the scene. The continuation of a road out of the canvas is colored to match the painting with brick-dust and earth mixed. In this way a genuine landscape is produced. Lay figures cut out of board also appear. One curious instance is shown in the illustration. Two men are seen carrying a litter on which a wounded man rests. The more distant soldier is painted on the canvas. The litter is real, two of its handles passing through holes in the canvas. The figure resting on it is made of boards in the most curious segments, that seem to bear no relation to the final effect. The nearer bearer is cut out of a flat board. The illusion is simply perfect. No one could tell how much was painted or how much was real. Other scenes in the foreground are similarily treated.

The result of the arrangement is that it is impossible to tell where the painting begins, it blends so perfectly into the actual foreground.

The spectators occupy an elevated stage, access to which is by a gallery that runs under the scaffolding of the foreground, being completely concealed thereby. By winding stairs the platform is reached, and the result is that the spectator loses all orientation, and cannot tell north from south. While looking at the picture, he must live in its scene. Neither can he form any conception of the size of the building. Although it is known that it is of moderate size, no approach to the true dimensions can be reached by any process of estimation.

Over the spectators' stage a circular screen is suspended that shades it from the light that enters through the skylights. The spectators are kept, to a certain degree, in obscurity, while the daylight pours in upon the painting, especially upon its upper parts. The sky is thus lighted up, and a peculiar luminous effect, favoring the aerial perspective, results. At night a number of electric lamps, suspended around the screen and out of sight of the spectators, illuminate the painting. The arrangement is that of footlights reversed. The lights and the dynamos are of the Ball system.

It would have been easy to have executed the painting by the mathematical rules of cylindrical perspective. By the photographic method, the necessity for this was obviated. Had the ten photographs been reproduced without any blending, it is manifest that a ten-sided canvas would be the theoretically perfect surface for their reception. But as it is, the artist has carried out the work so well that the perspective, aerial and linear, is beyond criticism.

The canvas is imported from Belgium, none being manufactured in this country that would answer the purpose. It is nine yards wide, and the seams run up and down.

The artist, Paul Philippoteaux, has been identified for many years with this form of art work. He was born in Paris, in 1846, studied under Cogniet and Cabanel, and won great success as a historical painter. With his father he painted a cyclorama of the defense of the Fort of Issy, which was exhibited for fourteen years in Paris. Some nine cycloramas have since been painted by him, and the one we are describing is his fourth Gettysburg.

Many of the details of the present picture were obtained by him from eye-witnesses. The uniforms, modes of carrying blankets, and the details of harness and of minor parts of the scenery were studied carefully. In the foreground are scattered some real pieces of harness and similar objects, and they compare perfectly with what is seen on the canvas.

We also show one of the scenes from a sketch by M. Philippoteaux—the death of Lieut. Cushing. This episode occurred when Pickett had nearly reached the Union line. Cushing's battery—the 45th U. S. Artillery—was all silenced with the exception of one gun, and he was mortally wounded and on the point of death. He managed to run his gun forward, and told General Webb (now president of the College of the City of New York) that he would give them one more shot. He fired his gun, cried out "Good by!" and fell dead. This incident appears in the foreground, and serves to establish the position of the spectators. The platform stands in the center of the Union line.

DEATH OF LIEUT CUSHING, 45TH U. S. ARTILLERY, AT GETTYSBURG.

Propagation of Flies.

Their particular office appears to be the consumption of those dead and minute animals whose decaying myriads would otherwise poison the air. It was a remark of Linnæus that three flies would consume a dead horse sooner than a lion could. He, doubtless, included the families of the three flies. A single fly, the *Naturalist* tells us, will sometimes produce 20,000 larvæ, each of which, in a few days, may be the parent of another 20,000, and thus the descendants of three flies would soon devour an animal much larger than a horse.

To mix sulphur for making joints under engine beds, melt the sulphur in an iron ladle in the same manner as with lead; only, cover the ladle, while melting, with a piece of iron to prevent fire.

CAPILLARITY AND HYDROSTATICS.

T. O'CONOR SLOANE, PH.D.

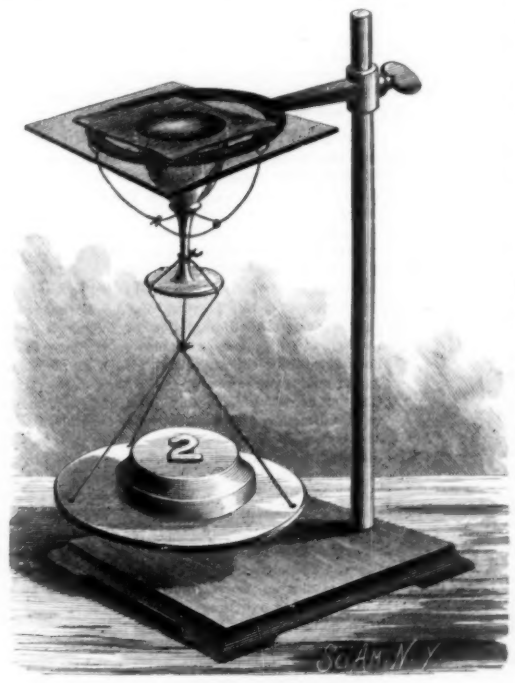
In the last issue a series of experiments in capillarity were described. The suggestion was made that the amount of vacuum determined by blotting paper could be subjected to a rough measurement by weighing. In the cut we show how this can be done. The wineglass is supported by blotting paper and glass plate on a retort stand, the vacuum having been produced in the manner described already. A loop of string hangs loosely below the body and surrounding the stem of the wineglass. A weight pan is suspended from its foot. Weights are placed on the pan until the joint is broken. Their weight, added to the weight of the glass, water, and scale pan, shows the strength which the joint developed. The loose loop is designed to catch the glass, and prevent it from spilling its contents, or falling and breaking.

A simple construction of the well-known Barker's mill is shown in the next illustration. For base, a small tin pan is used. In the center of this a step is secured, which is shown in section in the right hand corner. It consists of a short piece of brass tubing soldered to the bottom of the pan. A piece of glass rod, of corresponding diameter, has its end heated in a Bunsen burner or blow-pipe flame. While hot, a slight indentation is made in it by pressure with a pointed wire. Then the end is cut off, and dropped into the tube.

The rotating portion of the apparatus is made of two pieces of brass tubing, soldered together so as to be open throughout, and carrying a cup soldered on their upper end, communicating with their interior. Water poured into the cup will pour out from the lower ends. To the center of the cross piece a carpet tack is soldered, as a pivot to work in the glass step. Two pieces of bent glass tube, drawn to a point, are attached to the arms of the mill by India rubber tubing. A brace, shaped like an inverted V, soldered to the rim of the pan, with a hole in its apex, supports the moving part in a vertical position. Unless an opening and closing bearing is used, the vertical arm must be passed through the hole before the cup is soldered on. Water is poured into the cup. It issues in a general tangential direction from the glass tubes, and the mill rotates with great speed in the opposite direction.

The brass tubes should be of rather large bore, ¼ to ⅜ inch. The glass jets must be adjusted in size by trial. Filing or grinding square across the ends will enlarge them.

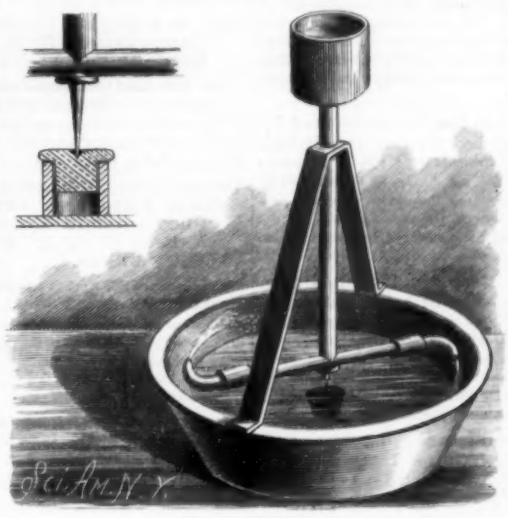
This apparatus works by true reaction. It is not the pressure of the water against the air that is the ultimate cause of its rotation; it is the mechanical energy in a horizontal direction that is imparted to the water. This acting at right angles to the cross arms generates an opposite reaction, that drives them backward. In a vacuum it will work faster than in the open air.



CAPILLARY VACUUM.

It might, at first sight, seem that such a machine would be of very low efficiency. But some have been constructed that gave very good power, and the turbine is of the same category, working by true reaction, and the best results have been attained with it. Many fireworks act on the same principle, especially wheels and rockets. Hence it is to be supposed that these would work in a vacuum, were such a practical experiment. The apparatus is named from Dr. Barker, who invented it toward the close of the seventeenth century. It may rank among the standard experiments in hydraulics, though its chief value for purposes of demonstration is in its illustration of the Newtonian law of action and reaction. The centrifugal force, it is said, assists in the rotation by increasing the pressure in the ends of the cross arms.

Another of the classic experiments performed with home-made apparatus is illustrated in the cup of Tantalus. The mythological legend of Tantalus, tortured in beholding food and drink spread before him, but withheld, gives it its name. A bottle is cut off so as to have about the proportions shown. This can be done with a hot poker or a piece of lighted "punk." A crack must first be started. This can be



BARKER'S MILL.

done by heating the bottle at the angle between its bottom and sides, and touching the place with a drop of water. A crack thus started can be led in any direction by a hot iron or other heated body. In order to have a guide by which to cut it straight, an India rubber band may be sprung around it, and arranged in a true position. The cut must be kept an even distance from this. As a small protuberance will almost certainly be left where the crack meets around the bottle, this may be broken off with the wards of a key, in small fragments like fine sand. A file will remove the cutting edge, or fifteen minutes' grinding on a plate of glass, with sand and turpentine, will bring it to a pretty true line, if the original cut was a straight one.

A piece of glass tubing is bent as shown, is passed through an aperture in a tightly fitting cork, and the cup is finished. A foot can be improvised from a corresponding portion of another bottle, or may be turned out of wood.

If water is poured into this vessel, nothing special occurs until the bend of the siphon is reached, when it immediately begins to run out through the bottom and empties the cup. Filling it to the point in question charges the siphon, which immediately begins to work, and continues until its lower opening within the cup is exposed to the air. To make the construction complete, a figure of Tantalus should be arranged to cover the siphon, with his mouth a little above its bend. Then, as the water nearly reaches his mouth, it begins to flow away.

The principle of this apparatus is used to explain the phenomena of intermittent springs. It is applied in sanitary engineering where it is desired to produce sudden or large flushes of water from limited supplies. In the Moulde or so-called Waring system of subsoil sewage disposal, the liquid is at intervals discharged by a similar apparatus, a flush tank, so as to fill the entire length of drainage pipes. A small and continuous stream of water may thus be made to supply a periodical flush of large volume for sewer pipes.

Brotherhood of Locomotive Engineers.

The annual convention of the Brotherhood of Locomotive Engineers began in New York, October 20, with a large attendance.

The opening public exercises were held in the Metropolitan Opera House, which was crowded with delegates, invited guests, and spectators.

Chairman William H. Gurney opened the meeting with a speech of greeting to the guests, and then the Rev. Delos Everett, Grand Chaplain of the Brotherhood, offered prayer. Then Mayor Grace was introduced, and made a short speech welcoming them to the city. This was followed by addresses from Gov. Abbett, of New Jersey, and Rev. T. De Witt Talmage.

Grand Chief Engineer Arthur then made his annual address, in which he said that now that the intellect, and also the ignorance, of the nation was knitting its brow over the solution of the so-called knotty problem of the nineteenth century, it was fitting that the Brotherhood, representing the unknown quantity of that problem, should meet together. In describing it as the unknown quantity, he would say that some had tried to equivocate their position and that of their executive officer, because of the conservative stand taken and his utter refusal to treat with other labor organizations. They maintained that a good labor organization was a good thing; but that a heterogeneous mass of men engaged in divers occupations could combine interests satisfactorily to form an organization which should serve all, and with equal justice, was very doubtful. Until there was nothing more to be done for the Brotherhood, could they afford to become interested in other things foreign to their order? They had no sympathy and could not co-operate with any class of men who based their claim for it on the principles that might is right and that the rich owe the poor a living. No man had a right to anything which he had not acquired honestly.

There was no antagonism between capital and labor, continued Mr. Arthur, but between work and idleness there had never been any other feeling. Most men of frugal habits were capitalists, capital being invested wealth, no matter how small. He urged upon the Brotherhood the desirability of life insurance, and recommended that its system be modified so as to allow members not so well off to take out policies of $1,500, instead of $3,000, as at present. The Brotherhood's Life Insurance Association now had 4,444 members. Twenty-seven members had died during the year, and two had become disabled. Seventy-eight claims had been paid, amounting to about $230,000. He was sure that the labor agitation of the past six months would result in good. What was necessary to settle the questions at issue was for both sides to give them full and fair consideration, which could only be reached by arbitration.

The public would always condemn the willful destruction of private property and the stopping of public business. During the Missouri Pacific and Texas Pacific troubles of last spring, the Brotherhood conducted itself in a way worthy of praise in resisting the threats and persuasions of the Knights of Labor. This loyalty had shown the railroad companies that a contract entered into by the Brotherhood would not be violated, and the companies would not hesitate to make other contracts with it when the occasion called for it. Moderation, conciliation, and arbitration must rule in dealings between employers and employed. Capital could not afford to be overbearing, and labor could not turn from peaceful channels without injury.

The Law as to Party Walls.

A party wall in law is the wall dividing lands of different proprietors, used in common for the support of structures on both sides. In common law, an owner who erects a wall for his own buildings, which is capable of being used by an adjoining proprietor, cannot compel such proprietor, when he shall build next to it, to pay for any portion of the cost of such wall. On the other hand, the adjoining proprietor has no right to make any use of such wall without consent of the owner, and the consequence may be the erection of two walls side by side, when one would answer all purposes. This convenience is often secured by an agreement to erect a wall for common use, one half on each other's land, the parties to divide the expense; if only one is to build at the time, he gets a return from the other party of half what it costs him. Under such an agreement, each has an easement in the land of the

CUP OF TANTALUS.

other while the wall stands, and this accompanies the title and descent. But if the wall is destroyed by decay or accident, the easement is gone, unless by a deed such contingency is provided for. Repairs to party walls are to be borne equally; but if one has occasion to strengthen or improve them for a more extensive building than was at first contemplated, he cannot compel the other to divide the expense with him. In some States there are statutes regulating the rights in party walls, and one may undoubtedly acquire rights by prescription on a wall built by another, which he has long been allowed to use for the support of his own structure.—*Building.*

ENGINEERING INVENTIONS.

An automatic car coupling has been patented by Mr. Joseph D. Majors, of Bragg's, Ala. In the drawbar is pivoted a spring-acted catch, having a rib adapted to engage the coupling link, and combined therewith are chains and levers for disengaging the catch from the link when desirable, this coupling being also readily used in coupling with other cars having the ordinary link and drawbar.

A steam engine has been patented by Mr. Desire F. A. Decaix, of Paris, France. The invention relates to the valve arrangement, a rotary or rocking plug or cock being employed in combination with a steam jacket surrounding the cylinder, and divided into two compartments or chambers by a central partition, the steam cylinder having at both ends holes or notches for the admission and exhaust of steam.

A feed water cleaner has been patented by Mr. James T. Bryant, of Richmond, Va. This invention covers an improvement on two former patented inventions of the same inventor, and provides a construction by which the sieve for stopping sediment may be cleaned by the steam from the injector when the latter is pulled back, and by which both the water inlet pipe and the injector feed pipe may be drained.

A car coupling has been patented by Mr. Albert H. Boles, of Hudson, Mich. In connection with a vertically slotted drawhead having a bridge is a combined hook and link mounted pivotally within the drawhead, a shaft with arms and crank arms, and a flexible connection between the arms and the pivotal shaft, whereby cars may be coupled or uncoupled without it being necessary for trainmen to enter the space between them.

A device for preventing the explosion of steam boilers has been patented by Mr. Bendix Meyer, of Gleiwitz, Prussia, Germany. It consists in a plate of suitable yielding material, applied to an opening in the boiler, and adapted to be bent or flexed outward at a certain steam pressure, so the steam will escape before the bursting pressure is reached, a rubber or other elastic packing being used between the plate and the boiler shell.

MECHANICAL INVENTION.

A gib and key has been patented by Mr. John H. Robison, of St. Joe, Pa. The key has an eye at one edge of its wider end, and combined therewith is a gib having a threaded shank received in the eye of the key, with a nut and jam nut for forcing the key into its place, the object being to obviate the present disadvantages in adjusting connecting rod boxes and other parts of machinery by tapping them in one direction or the other with a hammer.

AGRICULTURAL INVENTIONS.

A cultivator has been patented by Mr. James B. Scantlin, of Fairview, Kansas. It is designed for plants planted in rows in fields, nurseries, and gardens, and, while simple in construction, is intended to cut up all the grass and weeds between the rows and leave them upon the top of the ground to be killed by the sun.

A combination plow has been patented by Mr. William H. Stanly, of Quitman, Ga. The construction is such that the plow can be readily adjusted to work as a single or double plow, and can be guided and controlled as easily as an ordinary single plow, whether working upon level ground or on ground planted in ridges, being fitted alike for preparing the land and cultivating the plants.

A gang hoe has been patented by Mr. Franklin T. Gilbert, of Walla Walla, Washington Ter. It is intended especially for use in destroying weeds, and its construction is such that the hoes may be run below the ground surface at any desired depth, which may be regulated by the mechanism, and that, as the weeds are cut off and killed, the soil is raised as it passes over the rear ends of the hoes, and is thus efficiently broken up and pulverized.

MISCELLANEOUS INVENTIONS.

A log bunk for saw mills has been patented by Mr. Philo B. Williams, of Butler, Ind. It is made to be used in connection with either right or left hand mills, and is so constructed that both ends of the log may be thereby, at the same time, thrown against the head blocks of the saw mill carriage.

A bicycle has been patented by Mr. Albert K. McMurray, of Brooklyn, N. Y. The main driving wheel is mounted in a peculiar manner, and arranged to be driven at an accelerated rate of speed by treadles, arranged in a novel manner, connected to the cross bar of the machine by elastic or spring bands.

A rein holder has been patented by Mr. William D. Taber, of Rockville, R. I. It is made of a single piece of wire bent to form loops by which the device is caught upon the dashboard, and loops in which the reins may be inserted and held to place by the tension of the wire, thus making a double automatic clamping device.

A cloth winder has been patented by Mr. Albert Brown, of Mendocino, Cal. The object of the invention is to improve the action or working of bolt-supporting devices, the spindle bearings having a sliding arrangement, and there being special provisions for measuring the cloth as it passes over the reel, with numerous other novel features.

A composition for tanning has been patented by Mary Sutherland, of Diamond, Mo. It consists of extract of cockle burr, terra japonica, and extract of hemlock, with commercial sulphuric acid, in water, the mixture being prepared and used in a manner specified, and designed to effect the tanning of all kinds of hides and skins quickly and thoroughly.

A revolving extension table has been patented by Messrs. David and W. H. Harry Fauber, of Marshfield, Ind. This invention covers a novel construction and combination of parts in a firm and easily adjusted table, in which the extension leaves can be readily pushed in and drawn out, and will be firmly supported and held securely in place in either position.

A dauber for blacking brushes has been patented by Mr. Moreland M. Dessau, of South Framingham, Mass. It consists of a brush formed of bristles clamped in an annular space, with an adjustable ferrule surrounding the body of the dauber or brush and adapted to sustain the bristles, the improvement being also applicable to stencil and other stiff brushes.

A platform for trucks has been patented by Mr. Thomas Wright, of Jersey City, N. J. This invention consists principally in the employment of double inverted arch bars, for holding and supporting the forward ends of the crosspieces of the platform, whereby the platform is made lighter and cheaper than ordinary platforms, while being stronger and less liable to sag.

A scaffold clamp has been patented by Mr. Charles Whittingham, of Toledo, Ohio. It has a roller and crosspin arranged in a slot of the clamp block, so that they are not likely to be damaged by rough handling of the clamp, the device being one supporting the lateral bearers for scaffold floors on the scaffold posts, and being especially calculated to be effective and safe.

A boiler for steaming food has been patented by Mr. Le Roy S. Bunker, of Valton, Wis. This invention provides a simple and convenient form of boiler for making steam, which can, by an outlet pipe, be supplied to a vessel containing food to be steamed, the water tank for the supply being connected by a pump with a coil which runs through the fire box and into the main water compartment of the boiler.

A car starter and brake has been patented by Messrs. Thomas Cox and Thomas Cox, Jr., of Gloster, Montana Ter. The mechanisms employed to start and stop the car are controlled by a single lever, and the main object of the invention is to entirely dispense with the use of springs, the parts being so arranged that the starting mechanism may be employed time after time in quick succession, should the load upon the car be excessively heavy.

An automatic grain weighing and registering apparatus has been patented by Mr. Curtis L. Burgess, of Woodhull, Ill. Combined with a cylinder having two compartments and trunnions, with pivoted arms supporting the cylinder, is a weighing beam connected with the pivoted arms with a sprocket wheel having two pins on its face, and a lever operated by the pins on the sprocket wheel and connected with the registering device, with other novel features.

A cable grip has been patented by Mr. Thomas O. Cooper, of Wilmington, Del. This invention covers an improved construction, combination, and arrangement of parts of a grip for street cars moved by an endless cable, the arrangement being such that the cable can at any time be quickly dropped from the clamping jaws, or be as readily picked up thereby, the jaws being of soft metal, which can be readily removed and replaced when they become worn.

A hub attaching device has been patented by Mr. Walter A. Clark, of Chicago, Ill. The apparatus is so arranged that the wheel may be removed by imparting a simple turn to the hub cap, which will be returned to its normal position by the action of a spring, so that when the hub is slid upon the axle the parts will be in position to permit the automatic action of the retaining device, the construction being cheap, efficient, and durable.

A rack collar for the tempering wheels of pug mills has been patented by Messrs. George S. Adams, James Roach, and Elmer A. Sherwood, of Rondout, N. Y. The collar is made in two parts, hinged together and adapted to be held in place upon the bushing or hub of the wheel by a bolt or screw, so that, by removing the screw, the collar may be easily removed, and as easily replaced without removing the tempering wheel from its shaft or axle.

A shaking apparatus has been patented by Mr. Charles Collins, of Doctor Town, Ga. It is an apparatus for mixing liquids, and, in connection with a frame or plate having an opening, has a movable plunger rod, and other novel features, whereby a tray may be revolved to bring different cups opposite the operator, at will, various boxes or receptacles holding sugar, lemon, cracked ice, etc., in convenient position for use in mixing drinks.

A tanning process has been patented by Mr. James T. Rhyne, of Durant, Miss. After preparation in much the usual way, the tanning is effected with a mixture of water, gambier, salt, sulphuric acid, and saltpeter, then beaming by hand or passing through pressure rollers, immersing in lye water, and again in fresh water; after the hides are dry, they are treated with boiling hot fish oil and beeswax on the grain side, and a boiling mixture of tar, tallow, fish oil, and beeswax on the flesh side.

A scavenger mechanism for spinning and drawing machines has been patented by Mr. William A. Delmage, of Lowell, Mass. It is a device for collecting the broken ends of the yarn, and the waste produced by the usual drawing rolls, and conducting them away, so that they do not become entangled with the other threads, a pair of rollers being arranged to receive the broken ends and a pneumatic tube to receive the waste from the auxiliary rollers, there being also a friction roller to generate electricity to draw the broken threads and waste.

A process of manufacturing colored relief impressions on sheet metal has been patented by Messrs. Friedmann Priester and Otto Weidemann, of Berlin, Germany. It consists in coating the sheet metal with a specified isolating coat, on which is painted an elastic background, capable of absorbing colors, on which the desired pattern is placed, whereby the metal plates can be pressed into reliefs without displacing the coloring matters, and the colors will not be afterward affected by chemical action of their constituents with the metal.

NEW BOOKS AND PUBLICATIONS.

THE THEORY AND PRACTICE OF SURVEYING. By J. B. Johnson. New York: John Wiley & Sons.

This work, while practically adapted for the use of surveyors and engineers generally, is especially designed for the use of students in engineering. It treats very elaborately of the adjustment, use, and care of instruments, of topographical surveying by the transit and stadia, hydrographic, mining, and city surveying the measurement of volumes, geodetic surveying and projection of maps, map lettering, and topographical symbols. The book is profusely illustrated, and has numerous valuable tables.

THE SURVEYOR'S GIUDE AND POCKET TABLE BOOK. By B. F. Dorr. New York: D. Van Nostrand.

This little hand book quotes very liberally of United States law and the decisions of the Supreme Court on points touching surveying, and gives in very plain style a good deal of practical information on matters not usually treated of in books on surveying.

TOPOGRAPHICAL DRAWING AND SKETCHING, INCLUDING APPLICATIONS OF PHOTOGRAPHY. By Lieutenant Henry A. Reed, U. S. A. New York: John Wiley & Sons.

The author of this work is assistant professor of drawing at the United States Military Academy, West Point, and here gives the best methods of drawing and sketching as practiced there and in the principal topographical schools of the country, commencing with the most elementary details. The book is a handsome quarto, illustrated with many plates.

THE CIVIL ENGINEER'S FIELD BOOK. By Edward Butts. New York: John Wiley & Sons.

This is a handbook principally of tables, intended to save the time of the engineer in making mathematical field calculations. The formulæ are comparatively arranged in a systematic manner, and it has been sought to make the problems general, so they will cover any case that may arise in ordinary practice.

A Forthcoming Book on Aluminum. Messrs. Henry Carey Baird & Co., of Philadelphia, have in press a volume exclusively devoted to aluminum, its history, occurrence, properties, metallurgy, and applications, including its alloys. The work will be a 12mo volume of over 300 pages, and is edited by Mr. Joseph W. Richards. The cheapening of the production of this metal that has been already effected, by the use of electricity, and the possibility of still further lessening its cost, cause great public interest to attach to every addition to our knowledge of the subject, and this book will undoubtedly be welcomed by a large number of chemists and metallurgists.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Curtis Pressure Regulator and Steam Trap. See p. 142.

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Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 28.

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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) **S. N. M. asks: Would you kindly** inform me what would be the lightest, smallest, and most economical battery which would produce a permanent white incandescence in an exceedingly fine platinum wire, two to three inches in length? Please say at same time if there is any danger of fusion of the wire. A. Two or three good bichromate cells would answer for heating the wire. There would hardly be any danger of fusion, unless with more battery than the above. It all depends on the thickness of the wire and on its length.

(2) **F. F. asks: 1. Is the film of the** soap bubble air-tight or full of holes like a sieve? Does the bubble grow smaller just before breaking? A. It is air-tight, except as regards its power of dissolving the gases of the air and giving them off again. It does not grow smaller before bursting. 2. What good does it do to wash oxygen gas for use in the lime light? A. It washes out any particles of chloride of potassium that might be carried over and would tend to deteriorate the receivers. 3. Can I arrange a simple device to burn gasoline vapor for illumination by having it forced through pipes, the same as house gas? Please tell me how to carburet the vapor, and give a simple blower. A. We advise you to correspond with L. J. Marcy, 1340 Chestnut Street, Philadelphia, who has experimented in this direction, and is an authority on lantern work. The vapor is the carbureting agent; you do not carburet it. 4. Is there a work devoted to physical experiments projected by the magic lantern, such as tank projections, etc.? Would you suggest a list of them for the benefit of lecturers? A. Dalbear's Art of Projection, which we can supply for $1.50. The list of experiments is endless. Queen & Co., of 924 Chestnut Street, Philadelphia, show such apparatus in their illustrated catalogue. Correspond with them. 5. How can I condense the oxhydrogen flame to the smallest possible point for the microscope? What condensers do I need, and how shall I arrange them? A. You want strong light, not necessarily the smallest. Use 4½ inch plano-convex condensers, placed flat sides outward, determining their distance from light by trial.

(3) **C. W. M. asks what the coils, I,** are wound on, in the apparatus for demagnetization of watches, given in SCIENTIFIC AMERICAN of October 2, 1886? A. Pasteboard, wood, or any non-metallic substance may be used to construct the hollow core.

(4) **J. E. Z. asks the best material for** making a mould, and what metal will run the finest for a large button with a very fine engraving, regardless of color, one that will not frost or blister. A. Use steel, copper, or brass for the mould, and type metal for the button.

(5) **G. F. C. asks what effect common** brown sugar, mixed in a compound in the proportion of 10 pounds to 50 gallons of water, will have on the steel in boilers. A. It will have no effect on the steel of the boilers, but will collect the sediment in cakes,

which are liable to settle upon the fire sheet, and cause it to burn or bulge from overheating. See Davis' work on boiler incrustation, which we can furnish for $2.00.

(6) J. L. D. asks the best method of raising a large quantity of water by windmill a short distance, say 6 or 8 feet, for irrigation. A. A common lift pump with a cylinder equal in capacity to the power of the windmill is the most economical.

(7) T. J. T. asks whether the ordinary photograph camera will answer for taking tin types. A. Yes, but you require a special plate holder. 2. How are tin types made? A. The prepared plate, which may be purchased from dealers in photo materials, is coated with collodion, then immersed in a sensitizing nitrate of silver bath, and while wet exposed in the camera. Development is made by flowing the plate with a solution of sulphate of iron and acetic acid. It proceeds rapidly. The plate is next washed, and the unacted upon silver is dissolved off by immersing the plate in a bath of cyanide of potassium. After fixing it is slightly washed, rapidly dried over a spirit lamp, slightly colored with dry colors, varnished by flowing, and is ready for delivery. Tin types can be made out of doors. The position of the picture is always reversed.

(8) M. W.—There are always openings for persevering, energetic men in every branch of engineering in the United States, as well as in Great Britain. We do not know that there is a choice among the many branches. The name apprentice is now scarcely known in the United States. The English system is not practiced here. Young men enter engineering establishments on a business basis of usefulness. Our technical schools manufacture theoretical engineers by scores, who then have to travel the practical road by business employment with engineering firms.

(9) J. S. M. asks the cause of a bird gun leading. How does it affect the shooting, and what is the simplest receipt for removing and preventing it, by one in the country? A. The leading is caused by the friction of the shot on a dry barrel. A greasy wad will prevent it. A fine steel scratch brush with oil will remove the lead. Such a brush may be purchased of any gunsmith.

(10) W. B. D.—Scouring brick may be made by mixing sand with a small percentage of clay and baking. The quantity and heat required may be easily ascertainedby trial. Mucilage and gums may be used, but they are not equal to clay as a cement for scouring brick. A very small portion of Portland cement might be made available, to avoid the baking process.

(11) A. H. B. asks how to make a paper mould for stereotyping, and how to make it so that it will stand heat without breaking apart. A. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 310, 191. Also Wilson's book on stereotyping, $2.00, which we can furnish.

(12) C. W. B. asks if it is possible to cut through the casehardening on a casehardened axle with a diamond cutter; if not, can it be done by any other method without drawing the temper? A. It can be done with an emery wheel or with a piece of copper charged with emery.

(13) R. B. says: I have some ground glass which I wish to bring to a very high polish; what am I to use, and how? A. You cannot polish glass that has been ground on an emery wheel or grindstone. It should have a dead finish with the finest washed flour emery on a lap of metal, zinc or lead; or if the glass is large, use a rubber of metal. Then half polish with ground pumicestone on a leather rubber. Then polish with rouge on a buckskin rubber, moist. 2. Which is the best to use for grinding glass on—emery wheel or grindstone? A. Use either one, wet; the emery wheel cuts fastest.

(14) W. A. R. writes: In conducting the exhaust from a steam engine into a large tank of water for the purpose of warming the same, should the pipe used for that purpose increase or diminish in size, or remain the same for the entire distance (about 150 feet)? Should the pipe rise, fall, or remain horizontal? And at what point in the tank should it enter to obtain the best results? A. The exhaust pipe should be in the form of a coil suited to the size of the tank, with a descent in its course to enable the water to flow off in the same direction of the steam. A decrease in size would be proper if the water should remain cold enough to gradually condense the steam. Sometimes the water in the tank may become very hot from not being used, when the decreased size of the pipe would throttle the exhaust and make a back pressure in the engine.

(15) G. E. D.—The Great Eastern is composed of two continuous shells, an outside one and an inside one, about 3 feet apart, divided by bulkheads into compartments for safety. These compartments can be entered by manholes in the inner shell, which are closed by plates. The interior is also divided into compartments by decks and bulkheads like other iron ships. As a ship, the hull is one piece.

(16) T. P. B. asks how zinc amalgam is made for milling purposes; how the zinc is made to unite with the quicksilver and form a solid amalgam which may be broken when cold and added to quicksilver. A. Melt the zinc, and pour with a small spill from a height of 2 feet into a pail of water. This will chill it in shot and thin particles. Then dry and mix with the quantity of mercury desired for the amalgam in an iron ladle. Heat the ladle until the zinc is dissolved. Do not allow the heat to rise to the evaporating point for mercury.

(17) F. F. asks how the sound of the voice is transmitted over the telephone wire. A. In the electric telephone the transmitter transfers the vibrations of the air caused by the act of speaking, through the medium of the electro-magnet, into electric transmissions pulsating in harmony with the diaphragm of the transmitter. The electric transmissions reproduce through the electro-magnet of the receiver precisely the same pulsations as were uttered to the transmitter. There is no other physical connection of the equivalent pulsations between the terminals.

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TO THE STEEL MANUFACTURERS OF THE UNITED STATES OF AMERICA.

UNITED STATES NAVY DEPARTMENT,
WASHINGTON, D. C., Aug. 21, 1886.

The attention of all steel manufacturers of the United States is hereby invited to the requirements of the Navy Department in the way of armor-plates and heavy gun forgings, for the prosecution of work already authorized by Congress.

This advertisement invites all domestic manufacturers of steel to specify, in competition with each other, upon what terms they will engage to prepare for the production of and produce the forgings and armor-plate required for modern ordnance and armored ships; and no bids will be considered except such as engage to produce within the United States either all the gun-steel or all the armor-plate (or both) specified in this advertisement; nor will any bid be accepted unless accompanied by evidence satisfactory to the Department that the bidder is in possession of, or has made actual provision for, a plant adequate for its fulfillment.

Bids are hereby invited for supplying this Department with the under-mentioned material:

About 1,310 tons of steel gun-forgings, of which about 328 tons will be for guns of six inches caliber, 70 tons for guns of eight inches caliber, and 912 tons for calibers between ten inches and twelve inches (both inclusive).

These forgings are to be delivered rough bored and turned, and when in that state the heaviest forging which enters into the construction of a gun of each of the desired calibers will be about as follows:

6-inch	5¼ tons.
8 "	5 "
10 "	9½ "
10½ "	9½ "
12 "	17½ "

All these forgings must be delivered within the following times from the closing of a contract, viz.:

For 6 inch guns, 28 within one year, and the remainder within 18 months.

For 8 inch guns, within two years.

For 10 inch and larger guns, within 2½ years.

Preference will be given for earlier deliveries.

Also, about 4,500 tons of steel armor-plates, to be of the best material and manufacture, shaped accurately after patterns to fit the form of each vessel for which intended, and of such sizes as may be required, varying somewhat as follows:

20 feet by 8 feet by 12 inches thick.
17½ feet by 6 feet by 17 inches thick.
11½ feet by 6½ feet by 6 inches thick.

There will also be thinner plates.

For information concerning shapes and weights of the gun forgings and armor-plates, what parts must be manufactured in sets, time of delivery of each set, the chemical, physical, and ballistic tests, which the metal must sustain in each case, and for all other particulars, apply to the Chief of Bureau of Ordnance, Navy Department, Washington, D. C.

Each bid upon armor-plate must specify the time within which the bidder will engage to make delivery; and preference will be given to earliest proposed deliveries.

Proposals must be in duplicate, sealed and addressed to the Secretary of the Navy, Navy Department, Washington, D. C., the envelopes indorsed "Proposal for steel gun-forgings and armor."

They will be received at the Navy Department until 12 o'clock M. on the 10th day of December, 1886, at which hour the opening of the bids will take place.

The right is reserved to waive defects in the form of, and to reject any or all bids.

Ten per cent. of the contract price will be retained from the payment for each article delivered, until the contract, as far as relates to articles of that class, shall have been completed.

Separate bids may be submitted for the gun steel and for the armor, if any manufacturer so desires; but bids covering both will receive preference, other things being equal.

Bids will be compared in two classes.

First. Gun Forgings.

Second. Armor-plate.

And the total sum for which, and the time within which the whole of the material covered by each class will be produced and delivered will be alone considered.

WILLIAM C. WHITNEY,
Secretary of the Navy.

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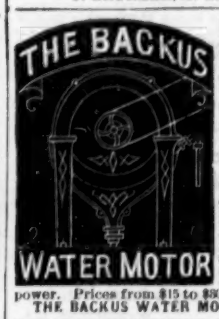

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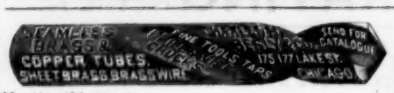

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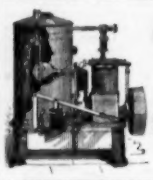

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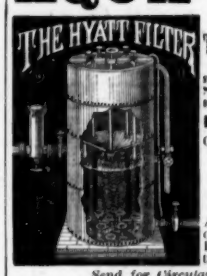

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